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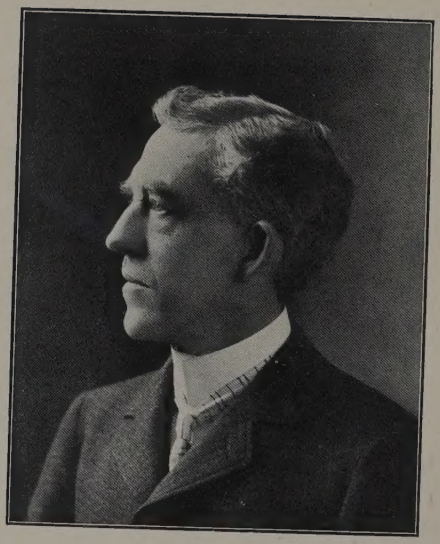

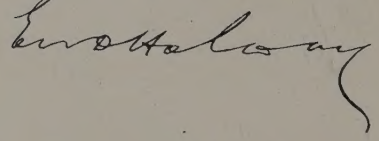

Journal of Mycology Portraits with Facsimile Autographs.

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A NEW SIROTHECIUM.

A. P. MORGAN.

SIROTHECIUM FRAGILE MORGAN sp. nov.—Perithecia superficial, globose or obovoid, crowded together on a thin white subiculum; the wall smooth, black, fragile, the upper part very thin and evanescent, the lower portion thicker and more persistent, supporting as in a cup the brown globular mass of spores. The inclosed hymenial hyphae, at maturity, wholly abjointed into long slender, branched chains of spores. Spores short-cylindrical, obtuse at both ends, smoky-pellucid, 4-5 x 2 mic.

Growing on old wood of Nyssa, Preston, O. Dec. 1903.

Perithecium 100-125 mic. in diameter; the wall breaking up irregularly, the upper portion soon disappearing.

The resemblance of this species to the obscure Bloxamia is very striking, but the spores are not "generated in closely packed tubes." See Cooke's Handbook page 934.

PROOF OF THE IDENTITY OF PHOMA AND PHYLLOSTICTA ON THE SUGAR BEET.

GEO. G. HEDGCOCK.

It has been asserted repeatedly during the past decade by leading phyto-pathologists of Europe that the Phyllosticta leaf blight and the Phoma root rot of the sugar beet were caused by the same fungus, but no cultural proof accompanied by inoculations has been made to establish the assumption. In order to ascertain the truth or falsity of such assertions, and also to try to discover if these imperfect fungi do not have perfect forms in their life cycle, an investigation was begun three years ago and continued intermittently till the present.

A large number of cultures have been made from sugar beets decaying with the typical black crown rot caused by Phoma, and from the peculiar concentric brown leaf spots produced by Phyllosticta upon the leaves of this plant. Pure cultures were isolated and grown under similar conditions both in test tubes and in Petrie dishes upon various agar and gelatin media and upon a number of vegetables. In all about fifty sets of cultures have been made. Although some variation of cultural characters was noted upon different media and under different physical conditions, the cultures from the two sources were similar when grown under the same conditions showing no distinct variation of the mycological characters, such as the color, dimension, and gross appearance of the spores, pycnidia and mycelium.

For the purpose of more certainly proving the identity of the two fungi, sugar beet plants were grown in the green house as follows for the purposes of inoculation. Sugar beet seeds were sterilized by placing them in concentrate sulphuric acid for thirty minutes then washing them thoroughly in sterile water and neutralizing the acid remaining in the seed coat by adding a ten per cent. solution of potassium hydroxide for a few minutes, then again washing in sterile water. These seeds were then placed in pots of soil which had been sterilized by heating to 100 degrees Centigrade for three hours upon three successive days. The plants from these seeds were grown in the greenhouse partly in the open and partly in a closed case. They were apparently free from either leaf blight or root rot fungi. Twelve plants were inoculated with Phoma and twelve with Phyllosticta, a similar number being used as a control. Similar leaf spots appeared in about three weeks upon both sets of inoculated plants, the control plants remaining free from disease. From both sets, leaf spots bearing mature pycnidia were taken and the fungus was isolated again and grown in pure cultures with the same results as before.

Beets whose roots were sound and healthy but whose leaves were diseased by Phyllosticta were placed during December,

1901, in a moist silo, and at the same time others were put in a dry cellar, those in the latter being examined from time to time. The basal portions of the petioles of the diseased leaves were left attached to the crown of each beet. In a month or so the petioles had been partially or wholly rotted by the Phyllosticta and in two months the decay had penetrated the crowns of the beets producing the typical Phoma rot. Cultures carefully removed with a hot scalpel from the interior portions of the diseased tissues of the petioles and roots developed cultures of Phoma.

In the study of cultures of the fungus from both leaves and roots, under certain conditions there were produced guttulated spores, but normally in either case the spores were free from either guttules or oil globules. This work indicates that in the case of the beet we have only one species of fungus which according to priority of generic names will be placed in the genus Phoma, and that the various species of Phoma and Phyllostica described upon sugar beets, garden beets and mangels are identical. A synonymy of names will be published later.

Mississippi Valley Laboratory, St. Louis, Mo.

NOTE ON THE GENUS HARPOCHYTRIUM.

GEO. F. ATKINSON.

At the suggestion of the editor I have prepared this short note on the genus HARPOCHYTRIUM for the JOURNAL OF MYCOLOGY — for the purpose of calling the attention of American students to these interesting Chytrids, to give brief characters of the genus, and the at present three species. I have also added a brief suggestion or two not brought out in my monographic treatment of the genus.[1]

In that paper I have described the development, formation of sporangia, formation and movement of zoospores, attachment to host, parasitism, relationship of forms, origin and distribution of species, and synonymy.

The genus is one of the *Chytridiales* and is probably best located in the family *Rhizidiaceae.* The plant body is elongated, narrowly fusiform, usually tapering to a point at the free end, but often more or less rounded at the basal end. Some of the individuals are straight but more often they are curved, sometimes strongly so. The plant is either sessile or attached to the host by a very short, slender stalk, or by a more or less elongated

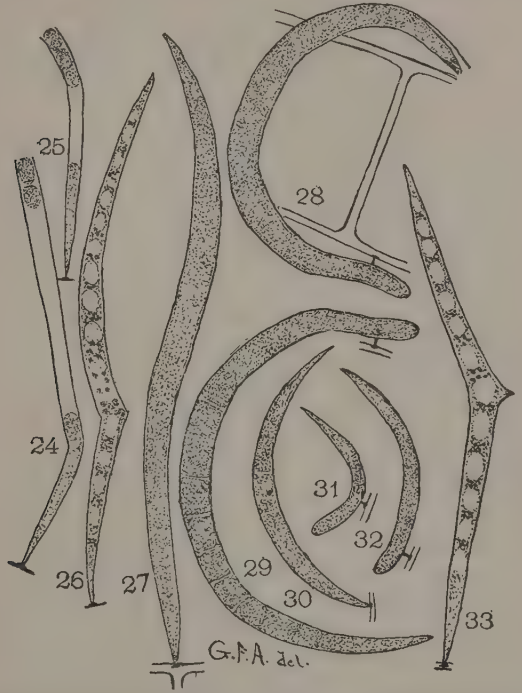
[1] The Genus Harpochytrium in the United States, Ann. Mycol. 1: 479-502, Pl. 10 and text Figures A-F, November 1903. [Ausgegeben am 10. December 1903.]

stalk, the latter being formed when the zoospore is prevented from coming in contact with the host cell by an envelope of gelatine with which some algae are provided. Even in the apparently sessile forms there is a short slender stalk which pierces the outer lamella of the host cell wall. The stalk expands into a disk shaped holdfast in the middle lamella, but in the smallest species this has not been certainly determined. When the plant is mature it is divided by a thin cross wall near the base into a small sterile basal part, and an outer long part, the sporangium. The tip of the sporangium gelatinizes and permits the escape of the zoospores which are oval and 1-ciliate. The zoospores either swim about with great rapidity in the water, or first show slight amoeboid movements, and then dart off with great rapidity, and finally come to rest on the host or in the gelatinous sheath surrounding the host, and attach themselves. The sterile base now forms a secondary sporangium in the empty one, and this may be repeated several times as in *Saprolegnia*. The plant probably is not derived from *Saprolegnia* by degeneration, but more likely is an example of the differentiation of a simple chytrid into a sterile and fertile part, the sterile part perhaps representing a rudimentary hypha.

My first knowledge of the genus was in 1896, when I found it at Ithaca, N. Y., parasitic on *Spirogyra* and rarely on *Zygnema*. This species proved to be *Harpochytrium hedenii* Wille, which has also been found in France, Tibet (Asia), and Patagonia (S. Am.), and Sweden.

Since the publication of my paper in the Annales Mycologici (l. c.) I have received drawings of a species of *Harpochytrium* from Dr. Lagerheim, a notice of which it seems desirable to incorporate in this note. His pencil sketches I have redrawn and they are here reproduced in text figures 24-26. These plants were growing on threads of *Vaucheria*. They are interesting as showing from the illustration that the base of the organism does not penetrate the cell wall, but expands into a disk-like holdfast and absorbent plate on the outer surface of the wall. This may be because of some peculiarity of the cell wall of the host. I am inclined to think that in some cases the form from Tibet is furnished with the disk-like holdfast on the outside of the cell wall, especially in the forms on threads of *Zygnema* which are covered with a thin slime layer. The slime would tend to prevent the zoospore from coming in contact with the cell wall directly and a very short slender stalk is developed to reach the host just as a longer stalk is developed in *H. hyalothecae* on the desmids with a thick slime layer. Text figure 26 represents a peculiar form of the plant, with a tendency to develop a short conic out-growth at one side as if there was a tendency to branch. A similar form I found in 1896 at Ithaca, but for

which there was not room in the Plate illustrating my paper in the Annales (see text Fig. 33).



HARPOCHYTRIUM HEDENII Wille. Figs. 24–26, on Vaucheria, Sweden; 27, 28, on Zygnema, Patagonia; 29–32, on Zygnema, Tibet; 33, on Spirogyra, United States.

These specimens from Dr. Lagerheim I think without doubt belong to *H. hedenii.* They were found growing on *Vaucheria* in an aquarium in the Botanical Institute of the Högskolan, Stockholm. Several years earlier Dr. Lagerheim found what he thinks the same organism on *Microspora stagnorum* in Stadshagen in Stockholm. He has searched again this last autumn for the same but the locality is so changed he was not able to find a trace of it. Dr. Thaxter of Harvard University informs me that he has found a species of *Harpochytrium* (which I suppose is *H. hedenii*) on *Saprolegnia* in Cambridge, Mass.

With regard to the wide distribution of *H. hedenii* some would probably attribute the forms in such widely separated areas as Tibet, Patagonia, and the United States, as due to a polyphyletic origin. It seems more reasonable, however, to regard them as having a common origin. I have shown in my

paper (l. c.) how it is quite possible that in Tertiary times the species could easily have passed from Europe to North America or *vice versa.* It is very likely that in even earlier times the condition of climate and topography of the two hemispheres might have been such as to have caused a wide distribution north and south before the modern types of the higher plants were evolved. The forms from Patagonia are shown in text Figures *27,* 28, and those from Tibet in text Figures 29-32. The latter show peculiar variations in form.

The species on which the genus was founded in 1890 by Lagerheim is *H. hyalothecae,* found on *Hyalotheca dissiliens* (consult the accompanying Plate). It was later found by Gobi in Finland, and by myself at Ithaca, N. Y., in 1903. At the same time (1903) the new species *H. intermedium* was found. Bibliographic references concerning the above species are given in the brief description of species at the close of this paper.

The plants seem to show some relationship to such forms of the genus *Rhizophidium* as *R. lagenula* (A. Braun) Schroeter,[2] and the example of *Chytridium lagenula* A. Braun[3] which he figures on *Conferva floccosa* (*bombycina*) looks very much like a young form of *Harpochytrium hedenii* Wille, but the description and figure are too imperfect to be certain, while the mature forms of *C. lagenula* on *Melosira varians* are quite certainly generically distinct, as is also *R. fusus* Zopf.[4]

Gobi[5] thinks the organism is an animal belonging to the *Flagellates,* and that algae like *Characium, Ophiocytium,* and *Sciadium* have been evolved from it. Wille,[6] while agreeing with Gobi that it shows a phylogenetic relationship with such algae, believes it is a chlorophylless alga derived from the green forms, much as he thinks the chlorophylless form *Chionaster nivalis* (Bohlin) Wille (*Cerasterias nivalis* Bohlin)[7] has been derived by descent from the chlorophyll bearing genus *Tetraedon.* It does not seem necessary, however, to search in either of these directions for the relationship of the genus since a more probable and closer relationship exists with such species of *Rhizophidium* as I have mentioned above. A consideration of all the facts seems also to show that the organism is one of the *Chytridiales,* and the

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[2] Rab. Krypt. Flora, *4,* p. 99.

[3] A. Braun. Ueber Chytridium eine Gattung einzelliger Schmarotzer gewæchse auf Algen und Infusorien. Abhandl. d. k. Akad. f. Wiss. zu Berlin, pp. 21-83, Taf 1-4 (1885), 1856.

[4] Nova Acta physico-medico=Verhandl. d. Leopold. Car. Acad. d. Naturforscher, *47,* p. 199, Tab. 18, Fig. 9-12, 1884, Nuernberg, Erlangen, etc.

[5] Gobi, Chr. Fulminaria mucophila, Nov. gen. et sp. Script. Bot. Hort. Univ. Imp. Petrop. Fascic. *15,* pp. 283-292, Tab. VII, Fig. 1 & 2, 1899.

[6] Willie, N. Ueber Cerasterias nivalis Bohlin. Nyt Mag. f. Naturvidenskab. *41,* pp. 171-176, 1903.

[7] Bolhin, K. Snöalgen från Pite Lappmark, Botaniska Notiser, Lund, 1893.

peculiar proliferation of the sporangia is known in at least one other genus of chytrids, in *Cladochytrium,* according to Nowakowski[8] in *Cladochytrium elegans* (Tab. 6, Fig. 14-17) and according to Clinton in *Cladochytrium alismatis.*[9]

Brief characterizations of the species might be given here with synonymy.

1. HARPOCHYTRIUM HYALOTHECAE Lagerheim, Hedw., 29, 142, 143, 1890. Plant body 20-60μ x 1.5-2μ attached at the basal end by a long and very slender stalk since the hosts are covered by a thick gelatinous layer; the base of the plant body is within the slime while the larger part projects beyond; fusoid and slightly curved, either projecting straight from the stalk, or bent, sometimes nearly to a right angle with it. Zoospores in one row, correspondingly small. Syn., *Harpochytrium hyalothecae* Schroet. in Rabh. Krypt. Flora 4. Pilze, p. 114, 1892; *Fulminaria mucophila* Gobi, Script. Bot. Fasc. *15,* 283-292, 1899; *Fulminaria mucophila* Wille, Nyt Mag. f. Naturvidenskab. 41, p. 175, 1903. Distribution, on Hyalotheca dissiliens, in Finnland, Sweden and U. S. of North America (Ithaca,, N. Y.) and on Sphaerozosma vertebratum, Cosmocladium species, Dictyosphaerium species, Finnland.

2. HARPOCHYTRIUM HEDENII, Wille, Petermann's Mitteilungen, Erg.-Heft no. 131, S. 371, 1900. Plants 80-180μ x 4-10μ the larger diameter accompanying the longer forms. Zoospores usually in a single row, 4-6μ, but in the broader forms in two to three rows. Plant sessile or with a very short stalk on some species of Zygnema perhaps those species which have a thin gelatinous envelope (I have found that many of the threads of Zygnema from the Tibet material have a thin gelatinous sheath). Syn., *Rhabdium acutum* Dangeard, Ann. Mycol. 1, 61-64, 1903; *Fulminaria hedenii* Wille, Nyt Mag. f. Naturvidenskab. 41, p. 175, 1903. Distribution, on Spirogyra and Oedogonium, France; on different species of Spirogyra, rarely on Zygnema, rarely on Harpochytrium hedenii, U. S. of North America (Ithaca, N. Y.); on Zygnema and Spirogyra in Tibet, Asia; and on Zygnema in Patagonia, S. Am.

3. HARPOCHRYTRIUM INTERMEDIUM Atkinson, Ann. Mycol. 1, 494 & 500, Pl. 10, Fig. 22, 23. 1903. Plant body 40-70μ x 3-4μ narrowly fusoid, straight or slightly curved, sessile. Zoospores in one row, correspondingly small.

EXPLANATION OF PLATE.

(Plate reproduced from the November No. of Annales Mycologici.)

HARPOCHYTRIUM HEDENII Wille.

Figs. 1, 2, 3, 4, 5, Young stage of plant on *Spirogyra* and *Zygnema,* developed in cell culture.

Fig. 6, Mature plant.

Fig. 7, Old plant with two empty sporangia and young tertiary sporangium growing out in the old secondary one.

Figs. 8, 9, Plants half grown showing large and long vacuoles separated by granular protoplasm. Both of these plants became freed from their attachment to the host, the one illustrated in Fig. 8 was attached at two points, one point directly at the base, the other upon the side a short distance from the end. The plant in Fig. 9 was attached at one point on the side, a little distance from the end. Here the short slender stalk and the disk-like expansion is shown. The plants are usually attached directly at the end, but in some cases, probably where the zoospore rests at first against the host cell on its side, the haustorium and absorbent disk are formed on the side.

Fig. 10, Plant coiled in the form of a serpent on the side of the *Spirogyra* thread.

Fig. 11, Old plant with empty sporangium and young secondary sporangium developing within.

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[8] Nowakowski, L. Beiträge zur Kenntnis der Chytridiaceen. Cohn's Beitr. z. Biol. d. Pflanzen, *2,* p. 72-100, Tab. 3-6, 1876.

[9] Cladochytrium alismatis. Bot. Gaz., *33,* pp. 49-61, pl. 2-4, 1902.

Fig. 12, Mature plant, zoospores escaping, sterile basal part limited by thin wall which is arched outward slightly because of the endosmotic pressure in the protoplast, and the removal of the pressure within the primary sporangium.
Fig. 13, One individual of *Harpochytrium* attacked by another, the parasitic one only half the size and age of the host individual.
Fig. 14, Later stage, showing degeneration of the host individual and the increased size of the parasitic individual.
Fig. 15, Mature individual attached at the side a short distance from the base.
Fig. 16, Mature individual attached at the end at a point between two adjacent *Spirogyra* cells.
Fig. 17, Same plant with zoospores escaping. This plant was kept in cell culture and the secondary sporangium from the sterile basal part began to grow before the developed zoospores escaped, and was forced out slightly at one side. The apex of individuals in Figs. 15, 16, show the peculiar condition shortly before formation of zoospores. In Fig. 17, amoeboid movement of some zoospores shown in the sporangium and also escaping.
Fig. 18, The zoospore after escaping from sporangium still showing amoeboid movement.
Fig. 19, Five individuals showing stages in attachment and elongation of zoospores. Figs. 6, 7, 11, 12, 13, 14, show the disk-like holdfast and absorbent disk between the outer and inner lamellae of cell wall.
Figs. 1–19 from specimens collected at Ithaca, N. Y.
Fig. 24, after Dangeard.

HARPOCHYTRIUM HYALOTHECAE Lagerheim.

Fig. 20, Showing two young individuals attached to cell of host (Hyalotheca dissiliens), one of the zoospores still within the slime and just having developed the slender stalk; the other individual, the zoospore having elongated and the outer end projecting beyond the slime sheath.
Fig. 21, Mature individual attacked by a filamentous bacterium.
Figs. 20, 21, from specimens collected at Ithaca, N. Y.
Fig. 25, after Gobi.
Fig. 26, after Lagerheim.

HARPOCHYTRIUM INTERMEDIUM Atkinson.

Fig. 22, Half grown individual attached to *Conferva utriculosa*, showing disk-like haustorium between outer and inner lamellae of cell wall.
Fig. 23, Mature individual with empty primary sporangium, and young secondary sporangium developing.
Figs. 22, 23, from material collected at Ithaca, N. Y.

CULTURES OF UREDINEAE IN 1903.[1]

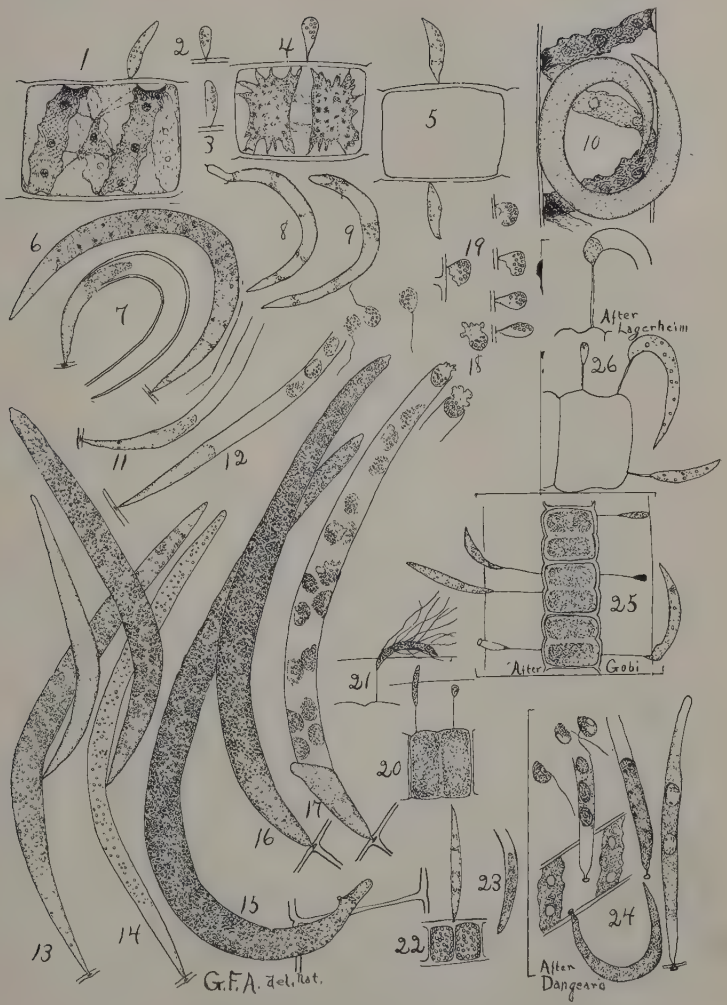
J. C. ARTHUR.

The present article forms the fourth of a series of reports[2] by the author upon the cultures of plant rusts. They cover the years from 1899 to the present inclusive. This report is devoted both to autoecious and heteroecious species, among which the grass and sedge rusts have had a prominent place. The number of species studied and the number of cultures made have fallen off somewhat from last year, partly because it was late in the spring before assistance was secured to carry on the work, and partly because a less number of collections of teleutospores and field observations were obtained upon which to base the work. The results however, fully equal in interest and importance those of last year, or possibly exceed them.

The expense of additional assistance in carrying on the work, and to some extent the expense of procuring material, was

[1] Read before the Botanical Society of America, St, Louis, December 30, 1903.

[2] See Bot. Gaz. *29*:268-276; Jour. Mycol. *8*:51-56; and Bot. Gaz. *35*:10-23.



THE GENUS HARPOCHYTRIUM

borne this year in part by the Indiana Experiment Station and in part by a grant from the Botanical Society of America. By this means I was enabled to have the services of Mr. J. Clyde Marquis, an undergraduate student of the university, who made part of the preliminary drop cultures and attended to the microscopical technique, and of Mr. Fred J. Seaver, a graduate of Morningside College, Sioux City, Iowa, and a fellow in botany at the University of Iowa, who made most of the sowings and drop cultures and kept the records. The most active period for this work extends from the middle of April to the middle of June, while a smaller portion of the work extends through the remaining months of the year. The grant from the Botanical Society also permitted systematic field observations at Fair Oaks in the oak barrens of northern Indiana, where many species of rusts abound, for the most part unlike those occurring at Lafayette where the chief field observations heretofore necessarily have been made. These excursions into an unworked locality resulted in the discovery of the Andropogon-Comandra combination, the undescribed Carex-Solidago combination, and the autoecious character of the wide-spread Lespedeza rust, as well as minor items.

During the present season 68 collections of material were employed, and 217 drop cultures were made from them to test the germinating condition of the spores. Out of these 26 collections refused to germinate, and were consequently useless. There were in all 215 sowings of spores made, representing 32 species of rusts, and for this purpose were required 72 species of hosts temporarily grown in pots in the greenhouse. As in previous years success was attained in no case except when definite clues derived from field observations were in hand.

In order to provide ample resources, as far as possible, so that whatever suggestions are obtained even late in the season can be tested without delay, a stock of teleutosporic material is laid in of any species obtainable. In consequence there are always some species on hand in germinating condition with no definite guide for their use. So far as time permits these are sown upon any hosts known to bear aecidia in the region where the rust abounds. The results so far have been confined wholly to the negative information that the aecidia could not be produced on certain hosts. The following is a record of such blind attempts made during 1903. Teleutospores were employed in every case.

1. Uromyces acuminatus Arth. on *Spartina cynosuroides* Willd. from Fair Oaks, Ind., was sown on *Hydrophyllum appendiculatum,* with no infection.

2. Puccinia Polygoni-amphibii Pers. on *Polygonum emersum* (Michx.) Britt. from Columbus, Ohio, and Fair Oaks,

Ind., was sown on the same host and on *Cicuta maculata,* with no infection. Last year this rust was sown on two other species of *Polygonum* without infection. Recently the preliminary announcement of rust cultures for the season of 1903 by Dr. W. Tranzschel of St. Petersburg has been published. He states that infection was secured on *Geranium,* showing that the widely distributed *Aecidium sanguinolentum* Lindl., commonly found on *Geranium maculatum* in America, is the alternate form of this rust. My own observations in the field all go to affirm the correctness of this result.

3. Puccinia on *Carex Pennsylvanica* Lam. from Red Cloud, Neb., and Fair Oaks, Ind., was sown on *Aster paniculatus, A. Drummondii, A. prenanthoides, Solidago rigida, S. canadensis, Xanthium Canadense, Silphium perfoliatum, Ribes Cynosbati, R. aureum, Geranium maculatum, Viola cucullata,* and *Onagra biennis,* with no infection.

4. Puccinia on *Carex gravida* Bailey from Red Cloud, Neb., was sown on *Aster Drummondii, A. paniculatus, Senecio obovatus, Boltonia asteroides, Silphium perfoliatum, Ambrosia trifida, Xanthium Canadense, Cleome spinosa, Sambucus Canadensis, Ribes Cynosbati, Xanthoxylum Americanum,* and *Onagra biennis,* with no infection.

5. Puccinia on *Elymus Canadensis* L. from Red Cloud, Neb., was sown on *Impatiens aurea, Symphoricarpos racemosus,* and *Napaea dioica,* with no infection. There are various reasons, of which the above is one, for thinking that the rust on the several species of Elymus, occurring east of the Rocky Mts., which has heretofore been referred to one species really belongs to several species.

6. Puccinia vexans Farl. on *Bouteloua curtipendula* (Michx.) Torr. from Red Cloud, Neb., was sown on *Cleome spinosa, Physalis heterophylla, Physalodes Physalodes, Cassia Chamaecrista,* and *Pentstemon hirsutus,* with no infection.

7. Puccinia tosta Arth. on *Sporobolus neglectus* Nash from Red Cloud, Neb., was sown on *Oxalis cymosa, Ceanothus Americanus, Symphoricarpos racemosus, Cassia Chamaecrista, Callirrhoe involucrata, Xanthoxylum Americanum, Cleome spinost,* and *Aster ericoides,* with no infection.

8. Puccinia emaculata Schw. on *Panicum capillare* L. from Fair Oaks, Ind., was sown on *Aster prenanthoides, A. Drummondii, Solidago rigida, Lactuca Canadensis, Eupatorium perfoliatum, Xanthium Canadense, Ambrosia trifida Apocynum cannabinum, Polemonium reptans, Ribes Cynosbati, Onagra biennis, Anemone Pennsylvanica,* and *Geranium maculatum,* with no infection.

Five species of rusts were successfully grown, that had been studied with success before, and reported upon by the writer and in part by other invesigators. Mention of them here serves to confirm previous work, and in two cases to give additional knowledge regarding hosts.

1. Puccinia Impatientis (Schw.) Arth.—Teleutosporic material of this species on *Elymus Virginicus* was obtained near Lafayette, Ind., and sown, May 13, on *Impatiens aurea.* On May 18, an abundance of spermogonia appeared, and on May 26, an equal abundance of aecidia began to show. This result confirms the work of last year.[3] The locality from which the teleutosporic material was obtained for this season's work is several miles from the one yielding material last year.

2. Puccinia amphigena Diet.—Teleutosporic material was obtained by the writer on *Calamovilfa longifolia* from the type locality at Chicago, Ill. A sowing was made on a mature leaf of *Smilax hispida,* May 23. Spermogonia appeared sparingly on May 29, but were not followed by aecidia. Another sowing was made on a partly grown leaf of the same host species, May 24, from which a great abundance of spermogonia began to appear on May 28, followed by an equal abundance of aecidia, June 5. Some question has been raised regarding the correctness of last year's work,[4] as the teleutosporic form is known from regions where it is thought that *Smilax* does not grow, but that the genuine *Puccinia amphigena* has its alternate form on *Smilax* can no longer be doubted.

3. Puccinia Andropogonis Schw.—Teleutosporic material on *Andropogon scoparius,* collected at Bloomington in southern Nebraska, was sent to Rev. J. M. Bates. It was sown on *Pentstemon hirsutus,* May 19, giving rise to abundant spermogonia on May 25, followed by aecidia on June 4. Previous cultures have been made by Mr. William Stuart and the writer,[5] and by Prof. W. A. Kellerman.[6] There can be no question that this is a wide-spread and common species in North America.

4. Puccinia albiperidia Arth.—Teleutosporic material of this species on *Carex gracillima* was most opportunely sent from Racine, Wis., by Dr. J. J. Davis. Sowing was made April 21, on *Ribes Cynosbati,* from which abundant spermogonia appeared on April 30, followed by great numbers of aecidia on May 11. A sowing made at the same time on *R. floridum* gave no infection. Three days later a sowing made on *R. aureum* seemed to have made a slight growth, which, nevertheless, came to naught. A sowing on *R. Uva-crispa,* a cut branch being placed in a glass of

[3] Bot. Gaz. *35*:18. 1903.
[4] Bot. Gaz. *35*:20. 1903.
[5] Bot. Gaz. *29*:272. 1900.
[6] Jour. Mycol. *9*:10. 1903.

water in the laboratory in lieu of a potted plant, gave some spermogonia, but the leaf fell from the stem before the time for the appearance of the aecidia. It would have undoubtedly been a successful infection, had the conditions been favorable for maintaining the vigor of the host. This species is based upon cultures made by the writer[7] in 1901. Its exact standing is yet in some uncertainty, and probably can not be settled until the connection of the very common aecidium, or aecidia if more than one kind, on the several species of *Ribes* is ascertained. Dr. J. J. Davis[8] has expressed the opinion that the whiteness of the aecidial cups is probably due to the conditions under which they are grown, and that they are normally orange-colored and identical with the common form. But the facts can only be ascertained by cultural studies.

5. Puccinia Helianthi Schw.—Ample teleutosporic material was available in vigorous germinating condition, collected by Prof .W. A. Kellerman at Sandusky, Ohio, and by the writer at Fair Oaks, Ind. All of it was on *Helianthus mollis*. Sowings began on April 29, and continued at intervals until June 2, twenty cultures being attempted. The sowings on *H. strumosus, H. tuberosus, H. grosse-serratus, H. rigidus,* and *H. Maximiliani* gave no infection. The sowing on *H. tomentosus* gave a slight infection, a few spermogonia appearing but reaching no further development, although the leaves were young and the plants exceptionally vigorous. On *H. mollis* and *H. annuus* an exceedingly strong infection was produced, numberless spermogonia appearing, followed by well developed aecidia in great quantity. The first sowings on *H. mollis* were made May 6, the first spermogonia appearing May 16, and the first accidia May 22 and 23. A second sowing was made May 29, giving spermogonia June 7, and aecidia June 16. The sowing on *H. annuus* was made June 2, showing spermogonia June 8, and aecidia June 17.

Cultures of the Helianthus-rust were made during the previous year's work,[9] employing spores from *H. grosse-serratus,* which were found to grow upon the same host and the similar *H. Maximiliani,* but not upon *H. strumosus.* Judging from the work of the two years, it appears possible to divide the Helianthus-rust into at least three series, for which the forms on *H. mollis, H. strumosus* and *H. grosse-serratus* may be taken as representatives respectively. Dr. E. Jacky[10] of Switzerland has made cultures, and has come to the conclusion that there are two species of Helianthus-rust, for which the names *P. Helianthi* Schw. and *P. helianthorum* Schw. are to be used. It seems to

[7] Jour. Mycol. *8*:53. 1902.
[8] Trans. Wis. Acad. Sci. *14*:88. 1903.
[9] Bot. Gaz. *35*:17. 1903.
[10] Centr. f. Bakt. *9*[2]:841. 1902.

me that the data are yet too meager to make it worth while to undertake to decide upon the nomenclature of the forms or species, which ever they may be called.

In addition to the foregoing results seven species of rusts were grown, establishing aecidial and teleutosporic connections, not heretofore recorded. The species are partly autoecious and partly heteroecious rusts.

1. MELAMPSORA MEDUSAE Thüm.—Teleutosporic material on *Populus deltoides* Marsh. was obtained in the vicinity of Lafayette, Ind., and although of inferior quality, for the poplar rust was not abundant in this region last year, it was sown on *Larix decidua* Mill. (*L. Europaea* DC.) April 28. After a rather long interval of 16 days I was surprised and gratified to observe the beginning of spermogonia (May 14) in good quantity; and five days later (May 19), the aecidia appeared, and proved to be a caeoma-form. A sowing on this host was tried last year[11] without infection, which is, however, easily accounted for by the fact that the host plants employed in 1902 were very feeble. For the supply of *Larix*, used this year I am indebted to the generosity of R. Douglas' Sons, proprietors of the Waukegan Nurseries at Waukegan, Ill. They sent without remuneration 25 very thrifty young larch, suitable for 6-inch pots, which made vigorous growth when brought into the greenhouse.

This species is the American representative of the European *M. populina* Lèv., both species having their aecidia on *Larix*. That the American form is specifically distinct from the European was pointed out by Klebahn[12] in 1899, the differences being especially marked in the form, size and markings of the uredospores, and in the apical thickening of the teleutospores. The American form may be characterized as follows:

MELAMPSORA MEDUSAE Thuem.

O. Spermogonia epiphyllous, numerous scattered, inconspicuous, pale yellow, papilliform, by vertical sections shown to be columnar or hemnispherical, raised above the surface, 40-55μ, in diameter.

I. Aecidia hypophyllous, numerous, scattered, small, less than .5 mm. in diameter, pale yellow; peridium absent; aecidiospores catenulate, globoid, 20 μ in diameter; wall colorless, nearly 3 μ thick, finely verrucose.

II. Uredospores amphigenous, or sometimes only hypophyllous, roundish, small, less than .5 mm. in diameter, early naked, somewhat pulverulent, orange yellow; uredospores oval, or obovate-oblong, 15-18 by 22-30μ usually flattened on opposite sides; wall colorless, 2.5-3μ, thick, or up to 10μ on the flattened sides, sparsely and evenly echinulate with fine papillae, except on the flattened sides which are smooth; paraphyses

[11] Bot. Gaz. *35*:11. 1903.
[12] Ztschr. f. Pfl.-Kr. *9*:144. 1899.

usually numerous, peripheral, capitate, smooth, 40-50 μ long, head 14-20 μ broad.

III. Teleutosori amphigenous, or sometimes only hypophylious, small, irregularly roundish and scattered, or somewhat coalescing, subepidermal, at first light reddish brown, becoming deep chocolate-brown; teleutospores prismatic, 12-14 by 30-44 μ, wall smooth, cinnamon-brown, uniformly thin, not thickened at apex.

Spermogonia and aecidia on *Larix*, but not yet collected. Uredo and teleutospores on *Populus deltoides* Marsh. (P. *Medusae* Benth., P. *Canadensis* Moench., *P. monilifera* Ait., *P. angulata* Ait.), *P. grandidentata* Michx., *P. tremuloides* Michx., *P. balsamifera* L., *P. angustifolia* Jas., and *P. trichocarpa* Torr. & Gr. Common throughout the United States and Canada.

2. Uromyces Phaseoli (Pers.) Wint.—This is a very common rust on various species of *Phaseolus, Strophostyles* and *Vigna.* Nevertheless its aecidial form is rarely seen, and it has been suggested that the American form might be heteroecious. Material for the cultures was collected near Lafayette, on *Strophostyles helvola* (L.) Britt. (*Phaseolus diversifolius* Pers.). It was sown, May 1, on *Euphorbia commutata* Engelm., with no infection. On May 15, a sowing was made on *Strophostyles helvola,* which gave abundant spermogonia on May 26, and well developed aecidia began to appear on June 4. Five subsequent sowings were made, but owing to difficulty in keeping the host-plants in flourishing condition only two of these gave positive results, and even these were less abundant than in the first trial. The autoecious character of the American form, however, is well demonstrated. It should be said that the somewhat common aecidium on *Apios* and *Amphicarpa* holds a doubtful relation to the bean rust, and is better considered distinct until positive relationship is established.

3. Uromyces Lespedezae-procumbentis (Schw.) Curt.—This is a wide spread, and often abundant rust, occurring on various species of *Lespedeza.* No aecidium has ever been found clearly associated with it. The small and inconspicuous *Aecidium leucospermum* B. & C., rarely collected, has been suggested as a possible alternate form, but not very confidently.

Excellent teleutosporic material was obtained by the writer at Fair Oaks, Ind., in March, on the upright stems of *Lespedeza capitata* Michx. It was not until late in May that a host-plant was well established in the greenhouse. A sowing of spores was made on May 28, the host being *L. capitata.* Infection resulted, but the development was slow, clearly due to inferior growth conditions. On June 14 the first spermogonia protruded, soon becoming exceedingly numerous, and on June 18, the minute, colorless aecidia began to appear in great numbers. The typical form of *Aecidium leucospermum* was the result.

4. Puccinia caulicola Tr. & Gall.—Fine teleutosporic material of this species on the stems of *Salvia lanceolata* Willd. was

sent to me in March by Mr. Elam Bartholomew, from Rockport, Kans. Seeds of the host were also sent, from which young plants were grown for culture work. A sowing was made on April 27; on May 11, the spermogonia began to appear, and on May 18, the aecidia. One later sowing was also successful, but the host plants did not flourish, and the results were meager. The demonstration, however, proved ample to establish the autoecious character of the species.

The aecidium of this species is so rarely seen as to give rise to the conjecture that the species might not possess an aecidium. The species is usually listed under *Puccinia nigrescens* Pk. This specific name, however, belongs to the somewhat similar European species, as pointed out by Bubák, who unnecessarily bestowed the new name *P. Salviae-lanceolatae* upon the American form. The rust occurs commonly upon the leaves, but is so much more conspicuous upon the stems, especially after the leaves have partly or wholly fallen, that most collections show the caulicolous form only.

5. Uromyces on *Carex*.—A species of *Uromyces on Carex* was found at Fair Oaks, Ind., on March 22 in very great abundance, and in fine viable condition. The *Carex* grew in an open sandy woodland, but in a depression of the surface where water sometimes gathered during heavy rains. It grew in tufts over a half acre of ground, and belonged to two species, *C. lanuginosa* Michx., easily told from the abundance of last year's fruiting culms still present, and *C. varia* Muhl., which showed not a trace of last year's culms, and was determined from the fruiting of a plant transferred to the greenhouse, and verified by a subsequent visit to the locality on May 3. On this latter visit a careful search for aecidia was made in the vicinity of the rusted *Carex,* but a few young leaves of a *Solidago* with spermogonia were the only result. These were growing with leaves intermixed and well surrounded by the rusted *Carex*. This was a very doubtful clue, as the common *Solidago* aecidium is known to belong to a *Puccinia,* yet experience has taught that the most improbable clues are not to be despised when the evidence is direct. Before finding this clue, sowings of the rust on *Carex varia* had been made on *Viola Cucullaria, Isopyrum biternatum, Trillium recurvatum, Ribes Cynosbati* and *R. aureum* with no infection. After the clue was obtained it was sown on five species of *Aster* with no infection, and on five species of *Solidago* with abundant infection. The following is the record of the latter. Sown May 6 on *S. Canadensis* L., showing abundant spermogonia on May 14, and aecidia on May 22. A sowing May 26 on *S. serotina* Ait. gave first spermogonia June 5, and aecidia June 16, the results being especially good. An equally successful culture was made on each of the two hosts at subsequent dates. Positive but less flourishing cultures were made on *S. flexicaulis*

L. and *S. caesia* L., clearly in accordance with the vigor of the host plants, while a sowing on *S. rigida* L. wholly failed, the host showing a weak growth.

The above sowings were all made from material on *Carex varia.* The collection on *C. lanuginosa,* taken at the same time and place, appearing in every way to be the same species, and to be in equally viable condition, was sown under equally favorable circumtsances on *Silphium perfoliatum, Ribes Cynosbati,* five species of *Aster,* and on *Solidago rigida, S. serotina* and repeatedly on *S. Canadensis,* all with no infection.

Whether the failure to infect the *Solidago* was due to some undetected oversight in manipulation, or is an indication of specific or racial difference in the rust, is a matter for which the facts do not warrant an opinion.

It is not easy to determine if this rust has been previously described and named or not. Upon morphological grounds it is clearly distinct from *Uromyces caricina* E. & E. and *U. minutus* Diet., but it may be the same as *U. perigynius* Halst. It also agrees well with collections from Wisconsin[13] on *Carex gracillima* Schw., from Decorah, Iowa,[14] on *C. pubescens* Muhl., and from Greencastle, Ind.,[15] on what was taken to be *C. pubescens,* but which a re-examination shows to be almost certainly *C. virescens* Muhl. If the rust on *C. varia* and *C. lanuginosa* had shown the same cultural behavior, I would have been inclined to unite these several collections under one name. But realizing the need of advancing cautiously among a group of species where only the first step has been taken, it seems wiser to give a separate name to the form about which we have definite knowledge, and leave the others to be dealt with later. The rust on *C. varia* with its alternate form is therefore, characterized under a new name, as follows:

Uromyces Solidagini-Caricis nom. nov.

O. Spermogonia epiphyllous, in small groups on yellow spots, punctiform, honey yellow, subepidermal, in vertical section shown to be globose, about 115 μ in diameter; isticlar filaments free, 60 μ long.

I. Aecidia hypophyllous, in groups, often circinating, peridia pale, low cylindrical, margin revolute, lacerate; aecidiospores globoid, or slightly elongated, 13-16 by 14-18 μ; wall colorless, thin, 1 μ or sometimes a little more, minutely rugose.

II. Uredosori not seen; uredospores among the teleutospores oval or obovate, about 16 by 23 μ; wall thin, echinulate.

III. Teleutosori hypophyllous, round, oblong or sometimes elongated, pulvinate, early naked, firm, chestnut-brown; teleutospores obovate, 15-18 by 23-28 μ, rounded or obtuse above, narrowed below; wall smooth, thin, 1.5-2μ, apex greatly thickened, 6-10μ; pedicel slender, tinted, as long as the spore, or longer.

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[13] Trans. Wis. Acad. Sci. *9*:180. 1892. Same *14*:90. 1903.
[14] Bot. Gaz. *16*:226. 1891.
[15] Same, l. c.

The collection on *Carex varia* Muhl., made at Fair Oaks, Ind., March 22, 1903, is taken as the type, together with the result of the culture on *Solidago Canadensis* L. obtained by a sowing made June 3, and matured July 1, 1903, at which date it was placed in the herbarium. I would tentatively refer here the collections referred to above on *C. gracillima, C. pubescens, C. virescens* (?) and *C. lanuginosa,* leaving their exact status to be determined later.

The aecidium of this species does not appear to differ in any marked manner from that of *Puccinia Caricis-Solidaginis* Arth., although, perhaps, the spores are a trifle smaller. I have not, however, had opportunity of collecting it in the field, as the heavy spring rains flooded the type locality and prevented all subsequent development of the rust, so that in subsequent visits at different times during the season the most dilligent search failed to reveal any trace of it on either *Solidago* or *Carex.*

6. Aecidium pustulatum Curt.—In early April, 1902, an observation was made at Spirit Lake, Iowa, that proved very puzzling for a time. On an open prairie, that had been burned over during the late fall, a small area showed *Comandra pallida* A. DC. with aecidia, and in contact with it *Andropogon scoparius* Michx. bearing uredo, of the characteristic thin-walled sort known to belong to the species with aecidium on *Pentstemon.* It was easy to find teleutospores on the grass leaves pressed into hollows, thus protected from the passing fire, and only in part germinated. These were collected and sown on *Pentstemon hirsutus* with no infection. A sowing was not made on *Comandra,* as no suitable growing plants were available. A similar observation was made again this year at Fair Oaks, Ind., and once more under circumstances that seemed to permit of no other inference but that the *Comandra* and *Andropogon* rusts were connected, highly improbable as it seemed. This time plants of *Comandra umbellata* (L.) Nutt. were secured. A sowing of teleutospores from *Andropogon furcatus* Muhl. was made on May 5, and spermogonia began to appear on May 16, but the host plant withered before time for aecidia to appear. A similar sowing was made on a more vigorous host, May 25, spermogonia appearing in great abundance May 30, and aecidia June 9. Another sowing of teleutospores from *A. scoparius* obtained in the same locality at Fair Oaks, was made on *Comandra umbellata* June 1, the first spermogonia appearing June 9, and aecidia June 19. Sowings of both sets of teleutospores were made twice on *Pentstemon hirsutus,* under the most favorable circumstances, with no infection. The conclusion is beyond all question, that a common rust on species of *Andropogon,* not readily distinguishable from *Puccinia Andropogonis* Schw., has its aecidia on *Comandra,* being identical with *Ae. pustulatum* Curt.

A rather careful study of the newly detected species appears to show that it is to be distinguished from *P. Andropogonis* Schw. by the very dissimilar aecidium, and by the pores of the uredospores, which number 5 to 8 and are distributed without order, while in *P. Andropogonis* they usually number 3, and are approximately equatorial. The name for the species should be PUCCINIA PUSTULATA (Curt.) nom. nov.

7. AECIDIUM RANUNCULI Schw. An exceedingly fortunate observation was made in May, within a few miles of Lafayette, Ind. On a somewhat shaded hillside, an area not exceeding ten feet long by three feet wide, attracted attention by the yellowness of the new vegetation. Looking closer, it was found that the growing mass was made up almost wholly of *Ranunculus abortivus* L. thickly covered with the *Aecidium Ranunculi* Schw., and an equal quantity of *Eatonia Pennsylvanica* (DC.) A. Gray, intermixed, not yet in flower, but every leaf covered with a light yellow uredo. No other rusts occurred for some distance around, and even none on the same hosts elsewhere in the locality.

Healthy plants of *Eatonia Pennsylvanica* were obtained from another locality, transferred to the greenhouse, and spores of *Aecidium Ranunculi* sown on the youngest leaves, May 13. From this sowing uredospores appeared on May 21, and characteristic teleutospores began to show June 3. Although the trial with teleutospores could not be made, yet the demonstration of the genetic relation of the two forms seems beyond question. A confirmatory observation upon the intimate association of the two forms in the field has been reported to me by Mr. E. W. D. Holway, from Decorah, Iowa.

This is one of the numerous grass rusts passing under the name of *Puccinia rubigo-vera.* It can not be called *P. Ranunculi,* as that name is preoccupied, and therefore, I propose the name

PUCCINIA EATONIAE nom. nov. (*Aecidium Ranunculi Schw.*)

O. Spermogonia hypophyllous, thickly scattered over large areas, preceding or among the aecidia, punctiform, honey-yellow, inconspicuous, subepidermal.

I. Aecidia hypophyllous, evenly scattered over large areas; peridia broad and short, recurved, finely lacerate; aecidiospores subglobose or elliptical, 15-22 by 18-25 μ; wall colorless, medium thick, 1.5-2 μ, minutely verrucose; mycelium perennial in the host.

II. Uredosori chiefly epiphyllous, on yellow spots, small, oblong, pale yellow, ruptured epidermis noticeable; uredospores obovate-globoid, 15-18 by 20-23 μ; wall thin when mature, about 1 μ, pale yellow, finely and evenly echinulate, pores 6-8, scattered.

III. Teleutosori chiefly hypophyllous and caulicolous, small, oblong to linear, covered by the epidermis; teleutospores oblong-clavate to linear-cuneate, 12-16 by 35-45 μ, truncate or rounded above, narrowed below, slightly or not constricted at the septum; wall smooth, light brown, thin, 1-1.5 μ, apex a litte darker and thicker, 3-4 μ; pedicel very short, colored; paraphyses none, or few.

8. AECIDIUM HYDNOIDEUM B. & C.—Coming upon some bushes of *Dirca palustris* L., the middle of June, that were conspicuous with great numbers of yellow aecidial spots, search was made for grass and sedge rusts in the vicinity. At one side, by a small ravine, was found a most luxurient growth of uredo upon *Bromus ciliatus* L., with last year's teleutospores on the dead radical leaves. The most distant bush of rusted *Dirca* was not over a hundred feet away.

As soon as suitable potted plants of *Bromus ciliatus* could be established in the greenhouse, aecidiospores from the *Dirca* were sown. The first sowing came to naught, as the host plant failed to grow well. A sowing on June 25 gave uredospores in abundance on July 4. Teleutospores were first observed on August 10, although they probably appeared somewhat earlier.

The success of this trial removes another rust from that limbo of grass forms passing under the name of *Puccinia rubigo-vera*. We may characterize the species as follows, under the name

PUCCINIA HYDNOIDEA (B. & C.) nom. nov. (*Aecidium hydnoideum* B. & C.)

O. Spermogonia amphigenous in small groups on large yellow spots, inconspicuous, punctiform.

I. Aecidia hypophllous, usually circinating about the spermogonia; peridia short, cylindrical, pale, margin slightly recurved, finely erose or torn; aecidiospores globoid or oblong-globoid, 11-15 by 14-19 μ; wall yellowish, thin, 1 μ, minutely and inconspicuously verrucose.

II. Uredosori chiefly epiphyllous, oblong, early naked, pulverulent, fuscous; uredospores globoid or obovate-globoid, 18-21 by 20-28 μ; wall brownish, thin, 1 μ, abundantly echinulate, pores 4 or more, scattered.

III. Teleutosori chiefly hypophyllous and caulicolous, small and numerous, oblong, covered by the epidermis; teleutospores linear-oblong, 13-18 by 30-50 μ, truncate or oblique above, obtuse or slightly narrowed below, not constricted at the septum; wall smooth, light brown, thin, 1-1.5 μ, thickened at apex, 4-7 μ; pedicel very short, colored; paraphyses none, or few.

This species, undoubtedly, does not embrace all the American rusts on Bromus. It is, doubtless, the common form east of the Rocky Mts. Probably the multicellular form, found in Wisconsin and Minnesota, *Puccinia tomipara* Trel., is distinct, although it has not yet been shown that such irregular multiplication of cells in the teleutospore is a permanent character.

SUMMARY.

The following is a complete list of successful cultures made during the season of 1903. It is divided into the two series: species previously reported by the writer or other investigators, and species now reported for the first time.

A. Species previously reported.

1. Puccinia Impatientis (Schw.) Arth. — Teleutospores from *Elymus Virginicus* L. sown on *Impatiens aurea* Muhl.

2. Puccinia amphigena Diet. — Teleutospores from *Calamovilfa longifolia* (Hook.) Hack. sown on *Smilax hispida* Muhl.

3. Puccinia Andropogonis Schw. — Teleutospores from *Andropogon scoparius* Michx. sown on *Pentstemon hirsutus* (L.) Willd.

4. Puccinia albiperidia Arth. — Teleutospores from *Carex gracillima* Schw. sown on *Ribes Cynosbati* L. and *R. Uva-crispi* L. (*R. Grossularia* L.)

5. Puccinia Helianthi Schw. — Teleutospores from *Helianthus mollis* Lam. sown on *H. mollis* Lam. and *H. annuus* L.

B. Species reported now for the first time.

1. Melampsora Medusae Thuem. — Teleutospores from *Populus deltoides* Marsh. sown on *Larix decidua* Mill.

2. Uromyces Phaseoli (Pers.) Wint.—Teleutospores from *Strophostyles helvola* (L.) Britt. sown on same host.

3. Uromyces Lespedezae-procumbentis (Schw.) Curt. — Teleutospores from *Lespedeza capitata* Michx. sown on same host.

4. Puccinia caulicola Tr. & Gall. — Teleutospores from *Salvia lanceolata* Willd. sown on the same host.*

5. Uromyces Solidagini-Caricis Arth.—Teteutospores from *Carex varia* Muhl. sown on *Solidago Canadensis* L., *S. serotina* Ait., *S. flexicaulis* L. and *S. caesia* L.

6. Puccinia pustulata (Curt.) Arth. — Teleutospores from *Andropogon furcatus* Muhl. and *A. scoparius* Michx. sown on *Comandra umbellata* (L) Nutt.

7. Puccinia Eatoniae Arth. — Aecidiospores from *Ranunculus abortivus* L. sown on *Eatonia Pennsylvanica* (DC.) A. Gray.

8. Puccinia hydnoidea (B. & C.) Arth.—Aecidiospores from *Dirca palustris* L. sown on *Bromus ciliatus* L.

Judging from the few instances that have come to my notice, the interest and importance of making observations upon proximity of aecidial and teleutosporic forms are not yet fully appreciated by American collectors of *Uredineae*. This is the most valuable method by which a reasonable conjecture can be made regarding the alternate connection of any one of the many scores of isolated aecidial forms, most of which are probably heteroeci-

* Successful cultures reported by Kellerman, Jour. Mycol. 9:27, Dec. 1903.

ous. Cultural work without such conjectures based on field observations are largely a waste of time, rarely leading to any positive information. The time to make observations is early spring, when the rusts first begin to show, mostly in April and May. Simple record of proximity is not especially important. The observations must show that the inference is well established, that the new growth of spores has come from germinating spores of another sort found near by. The ability to work out such an inference marks the logical and acute observer.

I desire to thank Messrs. Kellerman, Bates, Davis and Bartholomew for providing teleutosporic material, and also Mr. Holway for numerous favors. I have already mentioned the kindness of Messrs. R. Douglas' Sons in providing host plants; strong plants of *Callirrhoe involucrata* were sent by Mr. Bartholomew. My particular thanks, moreover, are due to the Botanical Society of America for providing funds by which the work could be prosecuted, not only in the laboratory but in the field. The observations at Fair Oaks, Ind., by far the most important of those made in a single locality, were rendered possible by the society's generosity.

Purdue University, Lafayette, Ind.

NOTES FROM MYCOLOGICAL LITERATURE. VIII.

W. A. KELLERMAN.

The Mycological articles in Annales Mycologici, Vol. I, No. 6, Nov. 1903, are as follows: The Genus Harpochytrium in the United States (Atkinson); Das Absterben der Stöcke der Johannis- und Stachelbeeren, verursacht von Cytosporina Ribis P. Magnus n. sp. (van Hall); Ueber die geographische Verbreitung der Meliola nidulans (Schw.) Cooke (Neger); Die Discomyceten-Gattung Aleurina Sacc. (Rehm); Urophlyctis hemisphaerica (Speg.) Syd. (Sydow); Mycotheca germanica Fasc. I (no. 1-50) Fasc. II (no. 51-100) (Sydow); Mycologische Fragmente (v. Höhnel); Eine Neue Puccinia auf Senecio (Dietel); Sur le Phytophthora infestans (Matruchot & Molliard).

The daily program of the American Association for the Advancement of Science, 53d Annual Meeting at St. Louis, last week in 1903, contained the following mycological papers: Cultures of Uredineae in 1903, J. C. Arthur; Uredineous Infections in 1903, W. A. Kellerman; Some Unusual Diseases of Plants in Iowa for the Season of 1903, L. H. Pammel; Symbiosis in Lolium, E. M. Freeman; A Lichen Society of a Sandstone Riprap, Bruce Fink; The Genus Harpochytrium; its Development, Synonymy and Distribution, G. F. Atkinson;

The Phylogeny of Lichens, F. E. Clements; The Necessity of Reform in the Nomenclature of Fungi, F. S. Earle; The Taxonomic Value of the Spermogonium, J. C. Arthur; Proof of the Identity of Phoma and Phyllosticta on the Sugar Beet, G. G. Hedgcock; Unpublished Notes on the Uredineae, M. A. Carleton; Craterellus taxophilus, a New Species of Thelephoraceae, C. Thom; Fungi Cultivated by Texas Ants, A. M. Ferguson.

Dr. Rud. Aderhold is the author of two illustrated leaflets, namely, Der Krebs der Obstbäume und seine Behandlung [Nectria], and Die Monilia-Krankheiten unserer Obstbäume und ihre Bekämpfung, which are publications of the Kaiserliches Gesundheitsamt, Berlin, Germany, Biologische Abtheilung für Land- und Forstwirtschaft, Flugblatt Nr. 14, Oct. 1902, and Flugblatt Nr. 17, Dec. 1902.

Uredineae japonicae, IV, by P. Dietel in Engler's Botanische Jahrbuecher, 32:624-632, gives a large number of new species, a few of the interesting ones being: Puccinia asparagi lucidi on Asparagus lucidus, Phragmidium heterosporum on Rubus trifidus, Uredinopsis corchoropsidis on Corchoropsis crenata: Aecidium polygoni-cuspidati on Polygonum cuspidatum, Aecidium hydrangeae paniculatae on Hydrangea paniculata and Aecidium fraxini-bungeanae on Fraxinus bungeana. Uredinopsis corchoropsidis occurs on a *Tiliaceous* host — heretofore representatives of this genus have been found only on Ferns.

Titles of mycological articles in Oesterreich. Bot. Zeitschrift for the years 1901 and 1902 are as follows. H. & P. Sydow — Zur Pilzflora Tirols; H. & P.Sydow — Uebersicht und Beschreibung sämmtlicher bisher auf der Gattung Crepis gefundenen Uredineen; Victor Kindermann—Ueber das sogenannte Bluten der Frucht Körper von Stereum sanguinolentum Fr.; P. Magnus — Ein Beitrag zur Geschichte der Unterscheidung des Kronenrostes der Gräser in mehrere Arten.

The Genus Harpochytrium in the United States is the subject of an extended article by Geo. F. Atkinson in Annales Mycologici, 1:479-502, Pl. X, Nov. 1903. He studied a form in 1895, and again the past season, occurring on Spirogyra, and proposes the name of Harpochytrium intermedium n. sp. He regards the generic names Fulminaria (by Gobi, 1889) and Rhabdium (by Dangeard, 1903), as synonyms with Harpochytrium (by Lagerheim, 1890). The known species are H. hyalothecae Lag. (H. hyalothecae Schroet., Fulminaria mucophila Gobi, Fulminaria mucophila Wille), H. hedenii (Rhabdium acutum Dang., Fulminaria hedenii Wille) and H. intermedium Atks.

C. J. J. van Hall outlines his observations and partial study of a prevalent and destructive disease of Currants and Gooseberries in North Holland, where these are extensively cultivated with great care and success and "therefore" remarkably

free from parasitic diseases. The root parasite is supposed by P. Magnus to be a new species. The article is published in Annales Mycologici, 1:503-512, Pl. XI, Nov. 1903, under the title: Das Absterben der Stöcke der Johannis- und Stachelbeeren, verursacht von Cytosporina Ribis P. Magnus (n. sp.)

Ellis & Everhart's Fungi Columbiana, Century XIX, edited and published by Elam Bartholomew, Stockton, Kansas, was issued Dec. 29, 1903. Three new species, with descriptions, appear in this century as follows: 1808, Ascochyta lethalis Ell. & Barth, n. sp., on living stems of Melilotus alba; 1820, Dicoccum psoraleae Ell. & Barth. n. sp., on living leaves and stems of Psoralea tenuiflora; 1874, Septoria grindeliae Ell. & Barth. n. sp., on living leaves of Grindelia squarrosa.

A report in Science, Dec. 25, 1903, of grants made by the Carnegie Institution for research during the fiscal year 1902-3, shows one Mycological subject, namely, Researches on the Cytological relations of the Amoebae, Acrasieae and Myxomycetes, E. W. Olive. The work was carried on in Professor Strasburger's laboratory in the Botanical Institute at Bonn, Germany. The sum granted for Mr. Olive's use was $1,000. Two papers are nearly completed incorporating a portion of his results.

The Structure and Classification of the Phycomycetes, with a revision of the Families and a rearrangement of the North American Genera, by Charles E. Bessey, is published in the Trans. Am. Micr. Soc. 24:27-54, Pl. II, Nov. 1903. The nine families of fungi are distributed among three orders, all of the class Chlorophyceae, of the branch Phycophyta. The author states that their affinities with their algal relatives, rather than their mutual relationships, must dominate their classification. To the groups, including genera, are added full and useful diagnoses preceded by extended synoptical keys.

A Key to the North American species of Inocybe (second part) is given by F. S. Earle in Torreya, 3:183-4, Dec. 1903. Twenty-five species are included, forming *sections* Rimosae, Velutineae, and Viscidae.

Ueber die in Gebaeuden auftretenden wichtigsten holzbewohnden Schwaemme von P. Hennings (Hedwigia, 42:178-191, 7 Oct. 1903) includes a very full general account of such fungi as Merulius lachrymans, Polyporus vaporarius, Lenzites sepiaria (L. abietina), Dædalea quercina, Fomes igniarius, Coniophora cerebella, Corticium giganteum, Lentinus squamosus, Coprinus domesticus, Armillaria mellea, Xylaria polymorpha, etc. The author states that he has found kürzlich in einem Hause bei Berlin auf der Unterseite feuchter, morscher kieferner Dielenbretter unter der Wasserleitung einen sehr kleinen schwarzen Pilz, namely, Coniothyrium domesticum P. Henn. n. sp. peritheciis superficialibus subglobosis vel ovoideis, sub-

papillatis, atris, membranaceo-subcarbonaceis, ca. 100-120 μ diam.; conidiis ovoideis ellipsoideis vel subcitriformibus, utrinque obtusiusculis, 1-2-guttulatis, læte brunneis, 8-10 x 4-5μ.

In Beiblatt zur Hedwigia, 42:(233)-(240), 7 Oct. 1903, P. Hennings publishes some interesting notes Ueber die an Bäumen wachsenden heimischen Agariceen. Some interesting statements are: that Collybia velutipes occurs on various species of *living trees* (commoner however on stumps); Pleurotus ostreatus common on *living* trunks, seldom on stumps; Pleurotus ulmarius epecially on *living* Elm trunks, in Schlesien on Tilia; Pluteus cervinus mostly on stumps of deciduous trees and evergreens, but also quite often on *living* trunks; Lentinus stypticus on stumps and on *living* Hazel; Schizophyllum alneum on prostrate Ash-stems, etc., also on *living* Linden, commoner in the tropics on various *living* tree trunks.

In Professor Bessey's article on Evolution in Microscopic Plants, Trans. Am. Micr. Soc. 24:5-12, Nov. 1903, we notice that the "chlorophylless members of the class of the green-algae (Chlorophyceae)", the more important families being Saprolegniaceae and Peronosporaceae, show but little modification from that of a *green felt*, the former having lost the chlorophyll, become reduced in size, and bear many zoospores; but the downey-mildews have become parasitic on higher (aerial) plants, and substituted conidia for zoospores and suppressed antherozoids. The Mucoraceae are "related to the green felts" — and in the sexual apparatus the greatest modifications have taken place.

In Mycologische Fragmente, Ann. Mycolog. 1:522-534, Nov. 1903, Dr. Franz v. Höhnel describes many new species and the following new genera: Bresadolella n. gen. Nectriacearum; Myxolibertella n. gen. — est *Libertella* vel *Myxosporium* cum sporulis filiformibus et oblongis (vel fusoideis) commixtis; Sporodiniopsis n. gen. Hyphomycetum; Cirrhomyces n. gen. Dematiearum; Aegeritopsis n. gen. — Tubercularieae mucedineae staurosporae. In the same article he states that Cercospora platyspora E. et Holw. on Zizia integerrima, and Cercospora sii E. et Ev. on Sium cicutifolium, are the same and höchst wahrscheinlich synonyms of Fusicladium depressum — not *Cercospora* because the spores are two-celled.

Corticium vagum B. & C. var. solanti Burt, a fruiting stage of Rhizoctonia solani, is reported by F. M. Rolfs in Science, N. S. 18:729, Dec. 4, 1903. This is based on a study of the Potato Rhizoctonia begun in 1901. "Observations show that potato plants developed from tubers which are more or less covered with sclerotia of this fungus usually have their subterranean parts overrun with a dark brown cobweb-like mycelium. This frequently extends up the green stems from one to three inches above the ground forming a thin hymenial layer which is usu-

ally gray-white in color. . . . The tips of the outermost branches of this hymenial layer become changed into basidia bearing from two to six sterigmata."

Eine Neue Puccinia auf Senecio von P. Dietel, (Ann. Mycolog. 1:535, Nov. 1903) is Puccinia tasmanica Diet. n. sp., Tasmania, in caulibus foliisque Senecionis vulgaris, IV, 1895. Aecidia and teleutospores are noted; adsunt etiam teleutosporae uniloculares.

Sydow, Mycotheca germanica Fasc. I (no. 1-50), Fasc. II (no. 51-100), the first two fascicles of a new set of Exsiccata, are noticed in Ann. Mycolog. 1:519 and 536, Nov. 1903. Diagnoses of the new species included (five in the first and six in the second Fascicle) are a part of the article here alluded to.

H. u. P. Sydow give a note in Annales Mycologici, 1: 517-8, Nov. 1903, touching "Urophlyctis hemisphaerica (Speg.) Syd." which Spegazzini described in Fungi Argent. IV, 1881, as Uromyces hemisphaericus. The authors list the synonomy of Urophlyctis hemisphaerica (Speg.) Syd. as follows: Uromyces hemisphaericus Speg. (1881), Urophlyctis kriegeriana P. Mag. (1888), Protomyces vagabundus Speg. pp. (1891), Cladochytrium kriegerianum A. Fisch. (1892), Entyloma hemisphaericum Speg. pp. (1889), Oedomyces hemisphaericus Speg. pp. (1903).

Numerous mycological articles have appeared in Comptes Rendus, T. 136, Jan.-June, 1903, par example: Beauverie, La Maladie des platanes; Coupin, Sur la nutrition du Sterigmatocystis nigra, Sur les formes tératologiques du Sterigmatocystis nigra privé de potassium; Dangeard, Observations sur la théorie du cloisonnement, Observations sur le Monas vulgaris, Un nouveau genre de Chytridiacées: le Rhabdium acutum, Sur le nouveau genre Protascus, La sexualité dans le genre Monascus, Sur le Pyronema confluens; Guilliermond, Contribution à l'étude de l'épiplasme des Ascomycètes, Nouvelles recherches sur l'épiplasme des Ascomycètes; Mangin, Sur la phthiriose, maladie de la Vigne causée par le Dactylopius Vitis et le Bornetina Corium, Sur la maladie du Châtaignier causée par le Mycelophagus Castaneae, Sur un nouveau groupe le Champignons, les Bornétinées, et sur le Bornetina corium de la Phthiriose de la Vigne; Marchal, La spécialisation du parasitisme chez l'Erysiphe graminis D.C.; Matruchot, Germination des spores de truffes; culture et caractères du mycèlium truffier, Sur les caractéres botaniques du mycélium truffier; Molliard, Rôle des bactéries dans la production des périthèces des Ascobolus; Prunet, Sur un maladie des rameaux du Figuier; Ray, Étude biologique sur le parasitisme: Ustilago Maydis.

INDEX TO UREDINEOUS CULTURE EXPERIMENTS WITH LIST OF SPECIES AND HOSTS FOR NORTH AMERICA. I.

W. A. KELLERMAN.

(Continued from p. 257, Vol. 9.)

Since the first part of this INDEX was published there has appeared (on the preceding pages of this No. of the Journal), an important article embodying the culture work of J. C. Arthur in 1903. The following additions thereto, including some corrections, are to be referred to their proper alphabetical place in that portion of the Index.

AECIDIUM ellisii Tr. & Gall. on Chenopodium album L., *see* Puccinia subnitens Diet. from Distichlis spicata (L.) Greene. [Kellerman.]

AECIDIUM on Helianthus grosse-serratus Mont. on H. maximiliani Schrad., *see* Puccinia helianthi Schw. from Helianthus grosse-serratus Mart. [Arthur.]

AECIDIUM on Helianthus annuus and H. mollis, *see* Puccinia helianthi Schw. from Helianthus mollis. [Kellerman]

AECIDIUM hydnoideum B. & C., from Dirca palustris L. (uredo and teleuto [Puccinia hydnoidea (B. & C.) Arth. n. n.] on Bromus ciliatus L.). J. C. Arthur. Jour. Mycol. 10:19. Jan. 1904.

AECIDIUM [Caeoma] on Larix decidua Mill., *see* Melampsora medusae Thüm. teleutospores from Larix decidua. [Arthur]

AECIDIUM leucospermum B. & C. on Lespedeza capitata Mx., *see* Uromyces lespedezae-procumbentis (Schw.) Curt. teleutospores from Lespedeza capitata. [Arthur]

AECIDIUM pustulatum Curt. on Comandra umbellata (L.) Nutt., *see* Puccinia pustulata (Curt.) Arth. teleutospores from Andropogon furcatus Muhl. and A. scoparius Mx. [Arthur]

AECIDIUM ranunculi Schw. from ranunculus abortivus L. (uredo and teleuto [Puccinia eatoniae Arth. n. n.] on Eatonia pennsylvanica (DC.) A. Gray). J. C. Arthur. Jour. Mycol. 10: 18. Jan. 1904.

AECIDIUM on Ribes cynosbati (spermogonia and aecidia), *see* Puccinia albiperidia Arth. teleutospores from Carex gracillima Schw. [Arthur]

AECIDIUM on Salvia lanceolata, *see* Puccinia caulicola Tr. & Gall. teleutospores from Salvia lanceolata. [Arthur]

ELYMUS virginicus L. (spermogonia and aecidia on Impatiens aurea), *see* Puccinia impatientis (Schw.) Arth. teleutospores from Elymus virginicus. [Arthur]

The preceding entries belong alphabetically with the first installment — printed on pp. 247-257, Vol. 9.

EUPHORBIA nutans (Uromyces euphorbiae C. & P. uredo and teleuto), *see* Uromyces euphorbiae C. & P. aecidiospores (Aecidium euphorbiae Am. Auct.) from Euphorbia nutans. [Arthur]

EUPHORBIA nutans Lag. (Uromyces euphorbiae C. & P. uredo on Euphorbia nutans Lag.), *see* Uromyces euphorbiae C. & P. aecidiospores from Euphorbia nutans Lag. [Arthur]

EUPHORBIA nutans (Uredo on Euphorbia nutans), *see* Uromyces euphorbiae C. & P. aecidiospores from Euphorbia nutans [Arthur]

EUPHORBIA nutans Lag. (Uromyces euphorbiae C. & P. uredo), *see* Uromyces euphorbiae C. & P. aecidospores from Euphorbia nutans Lag. [Arthur]

FARLOW, W. G. The Development of the Gymnosporangia of the United States [General account of results of cultures by himself, Thaxter, Halsted, and some European botanists.] Bot. Gaz. 11:234-241. Sept. 1886.

FARLOW, W. G. Development of Roestelia from Gymnosporangia. [Preliminary notice of Thaxter's work.] Bot. Gaz. 11:189-190. July 1886.

FARLOW, W. G. The Gymnosporangia or Cedar Apples of the United States. Anniv. Mem. Boston Soc. Nat. Hist. 1880, 38:1-38. Pl. 1-2. 1880.

FARLOW, W. G. Notes on some Species of Gymnosporangium and Chrysomyxa of the United States. Proc. Am. Acad. Arts & Sci. Boston, N. S. 12:311-323. 1885.

FESTUCA gigantea (Puccinia graminis tritici), *see* Puccinia graminis tritici uredospores from Triticum vulgare. [Carleton]

FESTUCA sp. indet. (Puccinia coronata Corda), *see* Puccinia coronata Corda uredospores from Avena sativa. [Carleton]

FRAXINUS viridis (Aecidium fraxini Schw.), *see* Puccinia peridermiospora (E. &. T.) Arth. from Spartina cynosuroides. [Arthur]

GYMNOCONIA interstitialis (Caeoma nitens Schw.) from Rubus occidentalis and R. villosus (Gymnoconia interstitialis teleuto [Puccinia peckiana Howe] on Rubus occidentalis and R villosus). G. W. Clinton. Bot. Gaz. 20: 116. March 1895.

GYMNOCONIA interstitialis (Puccinia peckiana Howe teleuto on Rubus occidentalis and R. villosus), *see* Gymnoconia interstitialis (Caeoma nitens Schw.) from Rubus occidentalis and R villosus. [Clinton]

GYMNOSPORANGIUM biseptatum from [Cupressus thyoides] (Roestelia botryapites on Amelanchier canadensis). Roland Thaxter. Proc. Amer. Acad. Arts & Sci. Boston, 14: 263. (Separate) Jan. 1887.

GYMNOSPORANGIUM biseptatum from [Cupressus thyoides] (————? spermogonia on Amelanchier canadensis). W. G. Farlow. Proc. Amer. Acad. Arts & Sci. Boston, N. S. 12:316. 1885.

GYMNOSPORANGIUM biseptatum from Cupressus thyoides (————? spermogonia on Crataegus tomentosa). W. G. Farlow. Annivers. Mem. Boston Nat. Hist. 1880:35. 1880.

GYMNOSPORANGIUM clavariaeforme DC. from Juniperus communis L. (Roestelia botryapites Schw. on Amelanchier [canadensis] and A. botryapium). Byron D. Halsted. Bull. Bot. Dept. State Agr. Coll. Iowa [1887]:90-2. Feb. 1888.

GYMNOSPORANGIUM clavariaeforme from [Juniperus communis] (Roestelia lacerata on Crataegus tomentosa). Roland Thaxter. Proc. Am. Acad. Arts & Sci. Boston, 14:262. (Separate) Jan. 1887.

GYMNOSPORANGIUM clavipes from [Juniperus virginiana] (Roestelia aurantiaca on Amelanchier canadensis and Pyrus malus spermogonia only). Roland Thaxter. Proc. Am. Acad. Arts & Sci. Boston, 14:264. (Separate) Jan. 1887.

GYMNOSPORANGIUM conicum from [Juniperus virginiana] (Roestelia cornuta on Amelanchier canadensis and Pyrus malus (spermogonia only). Roland Thaxter. Proc. Am. Acad. Arts & Sci. Boston, 14:264. (Separate) Jan. 1887.

GYMNOSPORANGIUM clavipes from [Juniperus virginiana] (————? spermogonia on Amelanchier canadensis, Pyrus arbutifolia and P. malus). W. G. Farlow. Proc. Am. Acad. Arts & Sci. Boston, N. S. 12:316. 1885

GYMNOSPORANGIUM ellisii from [Cupressus sp.] (Roestelia transformans (?) on Pyrus arbutifolia and (?) Ameliancher canadensis). Roland Thaxter. Proc. Am. Acad. Arts & Sci. Boston, 14:264 (Separate) Jan. 1887.

GYMNOSPORANGIUM globosum from Juniperus [virginiana] (Roestelia "lacerata z" [R. globosum Thax. as later used] on Pyrus malus, Pyrus americana and Crataegus crus-galli). Roland Thaxter. Conn. Agr. Exp. Sta. Bull. 107:4. 15 Apr. 1891.

GYMNOSPORANGIUM globosum from [Juniperus virginiana] (Roestelia sp.? (spermogonia only) on Crataegus coccinea, Pyrus americana and Pyrus malus.) Roland Thaxter. Proc. Am. Acad. Arts & Sci. Boston, 14:263. (Separate) Jan. 1887.

GYMNOSPORANGIUM globosum from Juniperus virginiana (————? spermogonia on Crataegus oxycantha, C. douglasii and Pyrus malus). W. G. Farlow. Proc. Am. Acad. Arts & Sci. Boston, N. S. 12:316. 1885.

GYMNOSPORANGIUM globosum from Juniperus virginiana (————? spermogonia on Crataegus tomentosa). W. G. Farlow. Annivers. Mem. Boston Soc. Nat. Hist. 1880:34. 1880.

GYMNOSPORANGIUM macropus from Juniperus virginiana (Roestelia [penicillata] on Pirus coronaria). Byron D. Halsted. Bot. Gaz. 11:190. July 1886. Bull. Iowa Agr. Coll. Bot. Dept. 1886:59-61. 1887.

GYMNOSPORANGIUM macropus from Juniperus virginiana (Roestelia pirata on Pirus malus cult.). F. C. Stewart and G. W. Carver. Proc. Iowa Acad. Sci. for 1895, 3:166. 1896. Reprinted in N. Y. Exp. Sta. for 1895:535. 1896.

GYMNOSPORANGIUM macropus from [Juniperus virginiana] (Roestelia pyrata on Pyrus malus). Roland Thaxter. Proc. Am. Acad. Arts & Sci. Boston, 14:262. (Separate) Jan. 1887.

GYMNOSPORANGIUM macropus from Juniperus virginiana (Roestelia pyrata on Pyrus iowensis). L. H. Pammel. Rep. Iowa State Hort. Soc. 1893, 28:470. 1894.

GYMNOSPORANGIUM macropus from Juniperus virginiana (——? spermogonia on Crataegus douglasii, Pyrus arbutifolia, P. malus and Amelanchier). W. G. Farlow, Proc. Am. Acad. Arts & Sci. Boston, N. S. 12:316. 1885.

GYMNOSPORANGIUM macropus from Juniperus virginiana (——? spermongonia on Crataegus tomentosa and Amelanchier canadensis). W. G. Farlow. Annivers. Mem. Boston Soc. Nat. Hist. 1880:34-5. 1880.

GYMNOSPORANGIUM nidus-avis Thax. nov. sp. from Juniperus virginiana (Roestelia nidus-avis on Cydonia (quince) and Amelanchier canadensis). Roland Thaxter. Conn. Agr. Exp. Sta. Bull. 107:4. 15 Apr. 1891.

Hibiscus moscheutos (Aecidium hibisciatum Schw., *see* Puccinia hibisciata (Schw.) Kellerm. (P. muhlenbergiae Arth., P. windsoriae Burr. non Schw.) from Muhlenbergiae mexicana. [Kellerman]

Hitchcock, A. S. and Carleton, M. A. Second Report on Rusts of Grain. Kansas Exp. Sta. Bull. 46:1-9. May 1894.

Hordeum distichum (Puccinia graminis), *see* Puccinia graminis uredospores from Triticum vulgare. [Hitchcock & Carleton]

Hordeum [distichum] (Puccinia graminis tritici), *see* Aecidium berberidis from [Berberis vulgaris]. [Carleton]

Hordeum [distichum] (Puccinia graminis tritici), *see* Puccinia graminis tritici uredospores from Triticum vulgare. [Carleton]

Hordeum jubatum (Puccinia graminis tritici on Triticum vulgare), *see* Puccinia graminis tritici from Hordeum jubatum. [Carleton]

Howell, J. K. The Clover Rust. Cornell Univ. Agr. Exp. Sta. Bull. 24:129-139. Dec. 1890.

Impatiens aurea Muhl. (Aecidium impatientis Schw.), *see* Puccinia rubigo-vera P. impatientis (Schw.) Arthur n. n. from Elymus virginicus L. [Arthur]

Impatiens aurea Muhl. (spermogonia and aecidia), *see* Puccinia impatientis (Schw.) Arth. teleutospores from Elymus virginicus L. [Arthur]

Juniperus communis L. (Roestelia botryapites Schw. on Amelanchier [canadensis] and A botryapium), *see* Gymnosporangium claviaeforme DC. from Juniperus communis. [Halsted]

Juniperus communis (Roestelia lacerata on Crataegus tomentosa), *see* Gymnosporangium clavariaeforme from [Juniperus communis]. [Thaxter]

Juniperus virginiana (Roestelia aurantiaca on Amelanchier canadensis and Pyrus malus [spermogonia]), *see* Gymnosporangium clavipes from [Juniperus virginiana]. [Thaxter]

Juniperus virginiana (Roestelia cornuta on Amelanchier canadensis and Pyrus malus [spermogonia only]), *see* Gymnosporangium conicum from [Juniperus virginiana]. [Thaxter]

Juniperus [virginiana] (Roestelia "lacerata z" [R. globosum Thax. as later used] on Pyrus malus, Pyrus americana and Crataegus crus-galli), *see* Gymnosporangium globosum from Juniperus [virginiana]. [Thaxter]

JUNIPERUS virginiana (Roestelia nidus-avis on Cydonia (quince) and Amelanchier canadensis), *see* Gymnosporangium nidus-avis Thax. from Juniperus virginiana. [Thaxter]

JUNIPERUS virginiana (Roestelia [penicillata] on Pirus coronaria), *see* Gymnosporangium macropus from Juniperus virginiana. [Halsted]

JUNIPERUS virginiana (Roestelia pirata on Pirus malus cult.), *see* Gymnosporangium macropus from Juniperus virginiana. [Stewart & Carver]

JUNIPERUS virginiana (Roestelia pirata on Pyrus iowensis), *see* Gymnosporangium macropus from Juniperus virginiana. [Pammel]

JUNIPERUS virginiana (Roestelia pyrata on Pyrus malus), *see* Gymnosporangium macropus from [Juniperus virginiana]. [Thaxter]

JUNIPERUS virginiana (Roestelia sp.? [spermogonia only] on Crataegus coccinea, Pyrus americana, and Pyrus malus), *see* Gymnosporangium globosum from [Juniperus virginiana]. [Thaxter]

JUNIPERUS virginiana (————? spermogonia on Amelanchier canadensis, Pyrus arbutifolia and P. malus), *see* Gymnosporangium clavipes from [Juniperus virginiana] [Farlow]

JUNIPERUS virginiana (————? spermogonia on Crataegus douglasii, Pyrus arbutifolia, P. malus and Amelanchier), *see* Gymnosporangium macropus from Juniperus virginiana. [Farlow]

JUNIPERUS virginiana (————? spermogonia on Crataegus oxycantha, C. douglasii, and Pyrus malus), *see* Gymnosporangium globosum from Juniperus virginiana. [Farlow]

JUNIPERUS virginiana (————? spermogonia on Crataegus tomentosa), *see* Gymnosporangium globosum from Juniperus virginiana. [Farlow]

JUNIPERUS virginiana (————? spermogonia on Crataegus tomentosa and Amelanchier canadensis), *see* Gymnosporangium macropus from Juniperus virginiana. [Farlow]

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KOELERIA cristata (Puccinia coronata Corda), *see* Puccinia coronata Corda uredospores from Avena sativa. [Carleton]

KOELERIA cristata (Puccinia graminis tritici), *see* Puccinia graminis tritici uredospores from Triticum vulgare. [Carleton]

LARIX decidua Mill. [L. europæa DC.] (spermogonia and aecidia [Cæoma]), *see* Melampsora medusae Thüm. teleutospores from Populus deltoides Marsh. [Arthur]

LARIX europæa DC., *see* Larix decidua Mill..

LEPTILON canadense (L.) Britt. (Puccinia caricis-erigerontis Arth. aecidia), *see* Puccinia caricis-erigerontis Arth. from Carex festucacea Willd. [Arthur]

LEPTILON canadense (L.) Britt. (Puccinia caricis-erigerontis Arth. aecidia, *see* Puccinia caricis-erigonertis Arth. from Carex festucacea Willd.

LESPEDEZA capitata Mx. (Aecidium leucospermum B. & C.), *see* Uromyces lespedezae-procumbentis (Schw.) Curt. teleutospores from Lespedeza capitata. [Arthur]

LESPEDEZA capitata Mx. (spermogonia and aecidia on Lespedeza capitata), *see* Uromyces lespedezae-procumbentis (Schw.) Curt. teleutospores from Lespedeza capitata Mx. [Arthur]

LYCOPUS americanus (Aecidium lycopi Ger.), *see* Puccinia angustata Pk. from Scirpus atrovirens. [Arthur]

LYCOPUS americanus Muhl. (Puccinia angustata Pk. aecidia [Aecidium lycopi Ger.]), *see* Puccinia angustata Pk. from Scirpus atrovirens Muhl. [Kellerman]

LYCOPUS americanus (Puccinia angustata Pk. uredo on Scirpus atrovirens), *see* Puccinia angustata Pk. aecidiospores [Aecidium lycopi Ger.] from Lycopus americana. [Arthur]

MELAMPSORA medusae Thüm. teleutospores from Populus deltoides Marsh. (spermogonia and aecidia [Caeoma] on Larix decidua Mill. [Larix europaea DC.]). J. C. Arthur. Jour. Mycol. 10:13. Jan. 1904.

MUHLENBERGIA mexicana (L.) Trin. (Puccinia hibisciata (Schw.) Kellerm. aecidia on Hibiscus militaris Cav.), *see* Puccinia hibisciata (Schw.) Kellerm. from Muhlenbergia mexicana (L.) Trin. [Kellerman]

PHRAGMIDIUM speciosum Fr. spermogonia on Rosa humilis, *see* Phragmidium speciosum Fr. from Rosa (hardy garden rose). [Arthur]

PHRAGMIDIUM speciosum Fr. from Rosa sp. (Caeoma miniata Am, Auct. on Rosa [Tea rose, Kaiserin Augusta Victoria]). J. C. Arthur. Bot. Gaz. 29:271. April 1900.

PHRAGMIDIUM speciosum Fr. from Rosa (hardy garden rose) ([Phragmidium speciosum Fr.] spermogonia on Rosa humilis). J. C. Arthur. Bot. Gaz. 35:17. Jan. 1903.

PHRAGMITES communis (Aecidium rubellum Pers. on Rumex crispus, R. obtusifolius), *see* Puccinia phragmitis (Schum.) Körn. from Phragmites communis. [Arthur]

PHRAGMITES communis Trin., *see* Phragmites phragmites (L.) Karst. [Arthur]

PHRAGMITES phragmites (L.) Karst. (P. communis Trin.) (Aecidium ranunculacearum (?) on Anemone canadensis), *see* Puccinia simillima Arth. from Phragmites phragmites L.) Karst. (P. communis Trin.). [Arthur]

PHRAGMITES phragmites (aecidia [Aecidium rubellum Pers.] on Rumex altissimus), *see* Puccinia phragmitis (Schum.) Körn. from Phragmites phragmites. [Bates]

PIRUS coronaria (Roestelia [penicillata]), *see* Gymnosporangium macropus from Juniperus virginiana. [Halsted]

PIRUS malus cult. (Roestelia pirata), *see* Gymnosporangium macropus from Juniperus virginiana. [Stewart & Carver]

PLANTAGO rugelii (Aecidium plantaginis Ces [?]), *see* Uromyces aristidae E. & E. from Aristida oligantha Mx. [Arthur]

POLYPOGON monspeliensis (Puccinia coronata Corda), *see* Puccinia coronata Corda uredospores from Avena sativa. [Carleton]

POPULUS deltoides Marsh. (spermogonia and aecidia [caeoma] on Larix decidua Mill. (L. europaea DC.), *see* Melampsora medusae Thüm. teleutospores from Populus deltoides. [Arthur]

PTELEA trifoliata (Aecidium pteleae), *see* Puccinia windsoriae Schw. from Tricuspis seslerioides. [Kellerman]

PTELEA trifoliata L. (Puccinia windsoriae Schw. aecidia [Aecidium pteleae B. & C.]), *see* Puccinia windsoriae Schw. from Tricuspus seslerioides Torr. (Triodia cuprea Jacq.). [Arthur]

PTELEA trifoliata (Puccinia windsoriae Schw. uredo on Triodia cuprea (Sieglingia sesleriodes Scrib.), *see* Puccinia windsoriae Schw. aecidiospores (Aecidium pteleae (Aecidium pteleae B. & C.) from Ptelea trifoliata. [Arthur]

PUCCINIA albiperidia Arth. sp. nov. from Carex pubescens Muhl. (Aecidium albiperidium Arth. on Ribes cynosbati L.). J. C. Arthur. Jour. Mycol. 8:53. June 1903.

PUCCINIA albiperidia Arth. teleutospores from Carex gracillima Schw. (spermogonia and aecidia on Ribes cynosbati L.). J. C. Arthur. Jour. Mycol. 10:11. Jan. 1904.

PUCCINIA americana Lagh. aecidiospores [Aecidium pentstemonis Schw.] from Pentstemon pubescens (Puccinia americana Lagh. uredo on Andropogon scoparius). J. C. Arthur. Bot. Gaz. 29:272. April 1900.

PUCCINIA americana Lagh. from Andropogon scoparius (Aecidium pentstemonis Schw. on Pentstemon pubescens). J. C. Arthur. Bot. Gaz. 29.272. April 1900.

PUCCINIA americana Lagh. uredo on Andropogon scoparius, *see* Puccinia americana Lagh. aecidiospores [Aecidium pentstemonis Schw.] from Pentstemon pubescens. [Arthur]

PUCCINIA americana Lagh. — a synonym of P. andropogonis Schw. [J. C. Arthur; Bull. Lab. Nat. Hist. Univ. Iowa, 5:182. May 1901.]

PUCCINIA amphigena Diet. from Calamovilfa longifolia (Hook.) Hack. (Aecidium smilacis Schw. on Smilax herbacea L. and S. hispida Muhl.). J. C. Arthur. Bot. Gaz. 35:20. Jan. 1903.

PUCCINIA amphigena Diet teleutospores from Calamovilfa longifolia (Hook.) Hack. (spermogonia and aecidia on Smilax hispida). J. C. Arthur. Jour. Mycol. 10:11. Jan. 1904.

PUCCINIA andropogonis Schw. from Andropogon scoparius ([Aecidium pentstemonis] spermogonia on Pentstemon hirsutus). W. A. Kellerman. Jour. Mycol. 9:10. Feb. 1903.

PUCCINIA andropogonis Schw., *see* P. americana Lagh.

PUCCINIA andropogonis Schw. teleutospores from Andropogon scoparius Mx. (spermogonia and aecidia on Pentstemon hirsutus). J. C. Arthur. Jour. Mycol. 10:11. Jan. 1904.

PUCCINIA angustata Pk. aecidia [Aecidium lycopi Ger.] on Lycopus americanus Muhl., *see* Puccinia angustata Pk. from Scirpus atrovirens Muhl. [Kellerman]

PUCCINIA angustata Pk. from Scirpus atrovirens (Aecidium lycopi Ger. on Lycopus americanus). J. C. Arthur. Jour. Mycol. 8:53. June 1902.

PUCCINIA angustata Pk. aecidiospores [Aecidium lycopi Ger.] from Lycopus americana (Puccinia angustata Pk. uredo on Scirpus atrovirens. J. C. Arthur. Bot. Gaz. 29:273. April 1900.

PUCCINIA angustata Pk. teleutospores from Scirpus atrovirens Muhl. (Puccina angustata Pk. aecidia [Aecidium lycopi Ger.] on Lycopus americanus Muhl). W. A. Kellerman. Jour. Mycol. 9:226. Dec. 1903.

PUCCINIA angustata Pk. uredo on Scirpus atrovirens, *see* Puccinia angustata aecidiospores [Aecidium lycopi Ger.] from Lycopus americana. [Arthur]

PUCCINIA atkinsoniana Diet. from Carex lurida (Aecidium sambuci Schw. on Sambucus canadensis). W. A. Kellerman. Jour. Mycol. 9:7. Feb. 1903.

PUCCINIA atkinsoniana Diet., synonym of P. sambuci (Schw.) Arth. n. n.

PUCCINIA atkinsoniana and P. bolleyana are identical and synonyms of P. sambuci (Schw.) nom. nov. [J. C. Arthur. Bot. Gaz. 35:15. Jan. 1903.]

PUCCINIA bartholomaei Diet. [P. jamesiana (Pk.) Arth. n. n.] from Atheropogon curtipendulus Fourn. (Bouteloua curtipendula Torr.) (Aecidium jamesianum on Aecidium jamesianum on Asclepias incarnata and A. syriaca L.). J. C. Arthur. Bot. Gaz. 35:18. Jan. 1903.

PUCCINIA bolleyana Sacc. from Carex trichocarpa (Aecidium sambuci Schw. on Sambucus canadensis). W. A. Kellerman. Jour. Mycol. 9:8. Feb. 1903.

PUCCINIA bolleyana Sacc. from Carex trichocarpa (Aecidium sambuci Schw. (?) on Sambucus canadensis). J. C. Arthur. Jour. Mycol. 8:55. June 1902.

PUCCINIA bolleyana Sacc. from Carex trichocarpa (Aecidium sambuci Schw.?) from Sambucus canadensis (Puccinia bolleyana Sacc. uredo on Carex trichocarpa. J. C. Arthur. Jour. Mycol. 8:55. June 1902.

PUCCINIA bolleyana Sacc. uredo on Carex trichocarpa, *see* Puccinia bolleyana Sacc. aecidiospores (Aecidium sambuci Schw.?) from Sambucus canadensis. [Stuart]

PUCCINIA bolleyana and P. atkinsoniana are identical and synonyms of P. sambuci (Schw.) nom. nov. [J. C. Arthur. Bot. Gaz. 35:15. Jan. 1903.]

Puccinia bolleyana Sacc., syn. of Puccinia sambuci (Schw.) Arth. n. n.

Puccinia caricina DC. from Carex trichocarpa, *see* Puccinia peckii (DeToni) Kellerm. n. n. [P. caricina DC. p. p.] from Carex trichocarpa. [Kellerman]

Puccinia caricis (Schum.) Reb. from Carex riparia (Aecidium urticae Schum. on Urtica gracilis). W. A. Kellerman. Jour. Mycol. 9:9. Feb. 1903.

Puccinia caricis (Schum.) Reb. aecidiospores [Aecidium urticae Schum.] from [Urtica sp.] (Puccinia caricis (Schum.) Reb. uredo on Carex stricta. J. C. Arthur. Bot. Gaz. 29:270. April 1900.

Puccinia caricis (Schum.) Reb. from Carex stricta Lam. (Puccinia caricis (Schum.) Reb. aecidia on Urtica gracilis). J. C. Arthur. Bot. Gaz. 35:16. Jan. 1903.

Puccinia caricis (Schum.) Reb. from Carex stricta (Aecidium urticae Schum. on Urtica gracilis). W. A. Kellerman. Jour. Mycol. 9:10. Feb. 1903.

Puccinia caricis (Schum.) Reb. from Carex stricta (Aecidium urticae on Urtica gracilis). J. C. Arthur. Jour. Mycol. 8:52. June 1902.

Puccinia caricis (Schum.) Reb. uredo on Carex stricta, *see* Puccinia caricis (Schum.) Reb. aecidiospores [Aecidium urticae Schum.] from [Urtica sp.] [Arthur]

Puccinia caricis (Schum.) Reb. aecidia on Urtica gracilis, *see* Puccinia caricis (Schum.) Reb. from Carex stricta Lam. [Arthur]

Puccinia caricis-asteris Arth. aecidia on Aster paniculatus, *see* Puccinia caricis-asteris Arth. from Carex foenea Willd. [Arthur]

Puccinia caricis-asteris Arth. sp. nov. from Carex foenea (Aecidium asterum Schw. on Aster paniculatus and A. cordifolius.) J. C. Arthur. Jour. Mycol. 8:54. June 1902.

Puccinia caricis-asteris Arth. from Carex foena Willd. (Puccinia caricis-asteris Arth. aecidia on Aster paniculatus). J. C. Arthur. Bot. Gaz. 35:15. Jan. 1903.

Puccinia caricis-erigerontis Arth. from Carex festucacea Willd. (Puccinia caricis-erigerontis Arth. aecidia on Erigeron annuus (L.) Pers., E. philadelphicus L. and Leptilon canadense (L.) Britt. J. C. Arthur. Bot. Gaz. 35:15. Jan. 1903.

PUCCINIA caricis-erigerontis Arth. from Carex festucacea (Aecidium [erigeronatum Schw.] on Erigeron annuus). J. C. Arthur. Jour. Mycol. 8:53. June 1902.

PUCCINIA caricis-erigerontis Arthur from Carex festucacea Willd. (Puccinia caricis-erigerontis Arth. aecidia on Leptilon canadense (L.) Britt). W. A. Kellerman. Jour. Mycol. 9:228. Dec. 1903.

PUCCINIA caricis-erigerontis Arth. aecidia on Erigeron annuus (L.) Pers., E. philadelphicus L. and Leptilon canadense (L.) Britt., *see* Puccinia caricis-erigerontis Arth. from Carex festucacea Willd. [Arthur]

PUCCINIA caricis-erigerontis Arth. aecidia on Leptilon canadense (L.) Britt., *see* Puccinia caricis-erigerontis Arth. from Carex festucacea Willd. [Kellerman]

PUCCINIA caricis-solidaginis Arthur n. n. from Carex jamesii Schw. (Aecidium solidaginis Schw. on Solidago canadensis L., S. caesia L. (spermogonia), S. rigida L. (spermogonia), S. serotina Ait., and S. ulmifolia Muhl. (spermogonia). J. C. Arthur. Bot. Gaz. 35:21. Jan. 1903.

PUCCINIA caricis-solidaginis Arth. n. n. (Puccinia on Carex jamesii Schw. and C. stipata Muhl., and Aecidium solidaginis Schw.). J. C. Arthur. Bot. Gaz. 35:21. Jan. 1903.

PUCCINIA caricis-solidaginis Arthur n. n. from Carex stipata Muhl. (Aecidium solidaginis Schw. on Solidago canadensis and S. serotina). J. C. Arthur. Bot. Gaz. 35:21. Jan. 1903.

PUCCINIA caricis-solidaginis Arth. aecidia on Solidago canadensis L., *see* Puccinia caricis-solidaginis Arth. from Carex stipata Muhl. [Kellerman]

PUCCINIA caricis-solidaginis Arth. from Carex stipata Muhl. (Puccinia caricis-solidaginis Arth. aecidia on Solidago canadensis L.). W. A. Kellerman. Jour. Mycol. 9:228. Dec. 1903.

PUCCINIA caulicola Tr. & Gall. (aecidia [Aecidium caulicolum Kellerm.] on Salvia lanceolata Willd.), *see* Puccinia caulicola Tr. & Gall. teleutospores from Salvia lanceolata Willd. [Kellerman]

PUCCINIA caulicola Tr. & Gall. teleutospores from Salvia lanceolata Willd., (Puccinia caulicola Tr. & Gall. aecidia [Aecidium caulicolum Kellerm.] on Salivia Salvia Willd.). W. A. Kellerman. Jour. Mycol. 9:227. Dec. 1903.

PUCCINIA caulicola Tr. & Gall. teleutospores from Salvia lanceolata Willd. (spermogonia and aecidia on Salvia lanceolata). J. C. Arthur. Jour. Mycol. 10:14. Jan. 1904.

PUCCINIA chrysanthemi Roze uredospores from Chrysanthemum indicum (Puccinia chrysanthemi Roze uredo on Chrysanthemum indicum). J. C. Arthur. Ind. Agr. Exp. Sta. Bull. 85:145. Oct. 1900.

PUCCINIA chrysanthemi Roze uredospores on Chrysanthemum indicum, *see* Puccinia chrysanthemi Roze uredo from Chrysanthemum indicum. [Arthur]

PUCCINIA cirsii-lanceolati Schroet. teleutospores from Carduus lanceolatus L. (Puccinia cirsii-lanceolati Schroet. aecidia [Aecidium cirsii-lanceolati Kellerm.] uredo and teleuto on Carduus lanceolatus L.). W. A. Kellerman. Jour. Mycol. 9:229. Dec. 1903.

PUCCINIA cirsii-lanceolati Schroet. aecidia [Aecidium cirsii-lanceolati Kellerman] uredo and teleuto on Carduus lanceolatus L., *see* Puccinia cirsii-lanceolati Schroet. teleutospores from Carduus lanceolatus L. [Kellerman]

PUCCINIA convolvuli Cast. from Convolvulus sepium (Aecidium calystegiae Desm. on Convolvulus sepium). J. C. Arthur. Bot. Gaz. 29:270. April 1900.

PUCCINIA coronata Corda on Alopecurus alpestris, Anthoxanthum odoratum, Avena fatua, A. pratensis, A. sativa, Dactylis glomerata, Eatonia sp. indet., Festuca sp. indet., Koeleria cristata, Phalaris arundinacea, Phleum pratense, Polypogon monspeliensis, *see* Puccinia coronata Corda uredospores from Avena sativa. [Carleton]

PUCCINIA coronata Corda on Avena sativa, Phalaris caroliniana, Arrhenatherum elatius, *see* Puccinia coronata Corda aecidium from Rhamnus lanceolata. [Carleton]

PUCCINIA coronata Corda aecidiospores from Rhamnus lanceolata (Puccinia coronata Corda on Avena sativa, Phalaris caroliniana, Arrhenatherum elatius.) Mark Alfred Carleton. U. S. Dept. Agr. Div. Veg. Phys. & Path. Bull. 16:48. 27 Sept. 1899.

PUCCINIA coronata Corda uredospores from Avena sativa (Puccinia coronata Corda on Alopecurus alpestris, Anthoxanthum odoratum, Avena fatua, A. pratensis, A. sativa, Dactylis glomerata, Eatonia sp. indet., Festuca sp. indet., Koeleria cristata, Phalaris arundinacea, Phleum pratense, Polypogon monpeliensis). Mark Alfred Carleton. U. S. Dept. Rgr. Div. Veg. Phys. & Path. Bull. 16:46-7. 27 Sept. 1899.

PUCCINIA eatoniae Arth. n. n. on Eatonia pennsylvanica (DC.) A. G.), *see* Aecidium ranunculi Schw. from Ranunculus abortivus L. [Arthur]

PUCCINIA fraxinata (Lk.) Arth. n. n. for P. atkinsoniana Diet. & P. bolleyana Sacc. [Arthur]

PUCCINIA graminis on Avena sativa, *see* Puccinia graminis uredospores from Avena sativa. [Hitchcock & Carleton]

PUCCINIA graminis on Avena sativa, *see* Puccinia graminis uredospores from Triticum vulgare. [Hitchcock & Carleton]

PUCCINIA graminis uredospores from Avena sativa (Puccinia graminis on Avena sativa). A. S. Hitchcock & M. A. Carleton. Kans. Exp. Sta. Bull. 46:3. May 1894.

PUCCINIA graminis on Hordeum distichum, *see* Puccinia uredospores from Triticum vulgare. [Hitchcock & Carleton]

PUCCINIA graminis on Triticum vulgare, *see* Puccinia graminis uredospores on Triticum vulgare. [Hitchcock & Carleton]

PUCCINIA graminis uredospores from Triticum vulgare (Puccinia graminis on Avena sativa). A. S. Hitchcock & M. A. Carleton. Kans. Exp. Sta. Bull. 46:3. May 1894.

PUCCINIA graminis uredospores from Triticum vulgare (Puccinia graminis on Hordeum distichum.) A. S. Hitchcock & M. A. Carleton. Kans. Exp. Sta. Bull. 46.3 May 1894.

PUCCINIA graminis uredospores from Triticum vulgare (Puccinia graminis on Triticum vulgare). A. S. Hitchcock & M. A. Carleton. Kansas Exp. Sta. Bull. 46:3. May 1894.

PUCCINIA graminis tritici [Aecidium], *see* Aecidium berberidis. [Carleton]

PUCCINIA graminis tritici on Elymus canadensis, E. can. glaucifolius, Triticum vulgare, *see* Puccinia graminis tritici uredospores from Elymus canarensis glaucifolius. [Carleton]

PUCCINIA graminis tritici uredospores from Elymus canadensis glaucifolius (Puccinia graminis tritici on Elymus canadensis, E. canadensis glaucifolius, Triticum vulgare). Mark Alfred Carleton. U. S. Dept. Agr. Div. Veg. Phys. & Path. Bull. 16:55. 27 Sept. 1899.

PUCCINIA graminis tritici on Hordeum [distichum], *see* Aecidium berberidis from Hordeum [distichum]. [Carleton]

PUCCINIA graminis tritici from Hordeum jubatum (Puccinia graminis tritici on Triticum vulgare). Mark Alfred Carleton. U. S. Dept. Agr. Div. Veg. Phys. & Path. Bull. 16:55. 27 Sept. 1899.

PUCCINIA graminis tritici on Triticum vulgare, Festuca gigantea, Agropyron richardsoni, Triticum monococcum, Hordeum [distichum], Koeleria cristata, *see* Puccinia graminis tritici uredospores from Triticum vulgare. [Carleton]

PUCCINIA graminis tritici on Triticum vulgare, *see* Puccinia graminis tritici-uredospores from Hordeum jubatum. [Carleton]

PUCCINIA graminis tritici from Triticum vulgare (Puccinia graminis tritici on Triticum vulgare, Festuca gigantea, Agropyron richardsoni, Triticum monococcum, Hordeum [distichum], Koeleria cristata). Mark Alfred Carleton. U. S. Dept. Agr. Div. Veg. Phys. & Path. Bull. 16: 54-5. *27* Sept. 1899.

PUCCINIA helianthi Schw. aecidia on Helianthus mollis and H. annuus L., *see* Puccinia helianthi Schw. from Helianthus mollis Lam. [Kellerman]

PUCCINIA helianthi Schw. from Helianthus mollis Lam. (Puccinia helianthi Schw. aecidia on Helianthus mollis Lam. and H. annuus L. W. A. Kellerman. Jour. Mycol. 9:230. Dec. 1903.

PUCCINIA helianthi Schw. from Helianthus grosse-serratus Mart. (Puccinia helianthi Schw. on Helianthus grosse-serratus Mart. and H. maximiliani Schrad.). J. C. Arthur. Bot. Gaz. 35.17. Jan. 1903.

PUCCINIA helianthi Schw. from Helianthus grosse-serratus Mart. and H. maximiliani Schrad., *see* Puccinia helianthi Schw. from Helianthus grosse-serratus Mart. [Arthur]

PUCCINIA helianthi from Helianthus [sp.] (Aecidium on Helianthus [sp.]). M. A. Carleton. Science, N. S. 12:250. 15 Feb. 1901.

PUCCINIA helianthi Schw. teleutospores from Helianthus mollis Lam. (spermogonia and aecidia on Helianthus annuus and H. mollis). J. C. Arthur. Jour. Mycol. 10:—. ——Jan. 1904.

PUCCINIA hibisciata (Schw.) Kellerm. from Muhlenbergia mexicana (L.) Trin. (Puccinia hibisciata (Schw.) Kellerm. aecidia on Hibiscus militaris Cav.) W. A. Kellerman. Jour. Mycol. 9:32. Dec. 1903.

PUCCINIA hibisciata (Schw.) Kellerm. aecidia on Hibiscus militaris Cav., *see* Puccinia hibisciata (Schw.) Kellerm. from Muhlenbergia mexicana (L.) Trin. [Kellerman]

PUCCINIA hibisciata (Schw.) Kellerm. n. n. (P. muhlenbergiae Arth., P. windsoriae Burr. non Schw.) from Muhlenbergia mexicana (Aecidium hibisciatum Schw. on Hibiscus moscheutos). W. A. Kellerman. Jour. Mycol. 9:109, 232. May, Dec. 1903.

PUCCINIA hydnoidea (B. & C.) Arth. n. n. on Bromus ciliatus L., *see* Aecidium hydnoideum B. & C. from Dirca palustris L. [Arthur]

PUCCINIA impatientis (Schw.) Arthur n. n. (Puccinia rubigovera p. p. [on Elymus virginicus]). [J. C. Arthur. Bot. Gaz. 35:19. Jan. 1903.]

PUCCINIA impatientis (Schw.) Arthur n. n., *see* Puccinia ribigovera [P. impatientis (Schw.) Arthur n. n. from Elymus virginicus L.] [Arthur]

PUCCINIA impatientis (Schw.) Arth. teleutospores from Elymus virginicus L. (spermogonia and aecidia on Impatiens aurea Muhl.). J. C. Arthur. Jour. Mycol. 10:11. Jan. 1904.

PUCCINIA jamesiana (Pk). Arth. nom. nov. (Puccinia bartholomaei Diet. and Aecidium jamesianum Pk. [J. C. Arthur. Bot. Gaz. 35:18. Jan. 1903.]

PUCCINIA lateripes B. & Rav. aecidiospores [Aecidium lateripes] from Ruellia strepens (Uredo and teleuto on Ruellia strepens). W. A. Kellerman. Jour. Mycol. 9:107 and 234. May, and Dec. 1903.

PUCCINIA lateripes B. & Rav. teleutospores from Ruellia strepens (aecidia [Aecidium lateripes Kellerm.] uredo and teleuto on Ruellia strepens). W. A. Kellerman. Jour. Mycol. 9:107 and 234, May and Dec. 1903.

PUCCINIA muhlenbbergiae Arth., *see* P. hibisciata (Schw.) Kellerm. n. n. [Kellerman]

PUCCINIA osmorrhizae on Chaerophyllum procumbens and (?) Washingtonia claytoni, *see* Aecidium osmorrhizae Pk. from Washingtonia claytoni. [Kellerman]

PUCCINIA panici Diet. uredo on Panicum virgatum, *see* Aecidium pammelii Trel. from Euphorbia corollata. [Stuart]

PUCCINIA peckii (DeT.) Kellerm. from Carex trichocarpa Muhl. Aecidium peckii DeT. on Onagra biennis (L.) Scop. (Oenothera biennis L.). J. C. Arthur. Bot. Gaz. 35:13. Jan. 1903.

PUCCINIA peckii (DeToni) Kellerm. n. n. (P. caricina DC. p. p.) from Carex trichocarpa (Aecidium peckii DeToni [Ae. oenotherae Pk.] on Onagra biennis (L.) Scop. [Oenothera biennis L.[W. A. Kellerman. Jour. Mycol. 8:20, also 9:9. May 1902, Feb. 1903.

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Puccinia sambuci (Schw.) Arth. n. n. (P. atkinsoniana Diet.) from Carex lurida Wahl. (Puccinia sambuci (Schw.) Arth. aecidia [Aecidium sambuci Schw.] on Sambucus canadensis). J. C. Arthur. Bot. Gaz. 35:15. Jan. 1903.

Puccinia sambuci (Schw.) Arth. aecidia [Aecidium sambuci Schw.] on Sambucuc canadensis, *see* Puccinia sambuci (Schw.) Arth. (P. atk insoniana Diet.) from Carex lurida Wahl. [Arthur]

(To be Continued)

THE AMERICAN MYCOLOGICAL SOCIETY.

BY THE SECRETARY.

The mycologists present at the Washington meeting of the American Association for the Advancement of Science in 1902, held an informal conference to consider the advisability of forming an organization. The sentiment proved to be strongly in favor of such a movement, but it was felt that the matter should be carefully looked into before decisive steps were taken. Accordingly, a committee on organization, consisting of Messrs. Earle, Shear, and Clements, was appointed to correspond with the mycologists of the country, and learn their views on the project. This committee met immediately to formulate plans and to draw up a tentative list of those whose interest might be such as to make them favor such a society. In April a circular letter was sent to these, in which expressions were asked as to the desirability and the form of organization. The response was so general and so enthusiastic, that the committee decided to proceed in the matter of making definite plans for organizing at St. Louis. A second letter was issued in December, fixing a time for meeting, and calling attention to the fact that arrangements had been made with Section G, by which Wednesday morning of the session was set apart for a mycological program.

The meeting for organization was called to order at 4 P. M. Tuesday, December 29, 1903, in the Central High School. A temoprary organization was effected by electing Professor Arthur chairman, and Dr. Clements secretary. The report of the committee was read by Mr. Shear; it was as follows:

"The committee appointed at the informal meeting of the mycologists held at Washington last winter beg leave to submit the following report. Letters were sent to twenty-five mycologists, presenting a tentative plan, and asking their opinion as to the desirability of the society and the form of organization, whether as an independent society or a sub-section Answers have been received from twenty-four of these, all heartily favoring the movement. As there was considerable diversity of opinion as to the form of the society, the committee has thought it best to suggest that an independent organization be perfected at present, but with the express purpose of affiliating as a section when feasable. Your committee has seen fit to call a meeting with a view to organization at this time, as the needs of our work and the sentiment of mycologists seem amply to justify such action. Through the courtesy of Section G, a mycological program has been arranged for Wednesday morning. Letters to this effect have been sent out to the mycologists, and in nearly every case replies have been received, expressing approval of the course.

In order to further facilitate permanent organization, your committee submits herewith the tentative draft of a constitution, together with proposals for committees upon charter membership; upon terminology, chromotaxia, etc., and upon affiliation with other botanical societies."

The report of the committee was accepted, with the exception of the provision relating to constitution, and the committee was discharged. It was moved by Professor Atkinson, seconded and carried, that the meeting organize permanently under a simple set of rules. It was also moved and carried that the meeting proceed to the election of a president, vice-president, and a secretary-treasurer, to serve to the close of the next annual meeting, and that the ballot be *viva voce*.

The following officers were elected: President, Dr. Thaxter, Harvard; Vice President, Dr. Earle, New York; Secretary-treasurer, Dr. Clements, Nebraska. It was moved and carried that the president be empowered to appoint a committee of three to consider plans of affiliation with the other societies. The president asked for an expression of opinion in regard to the matter of affiliation, in the course of which it was evident that the society was a unit in favor of such a step. The committee appointed consists of Mr. Shear, Professor Atkinson, and Professor Burrill. Dr. Farlow raised the question of the membership of the society, and it was finally determined that those present as well as those to whom the circular letters were sent should be considered charter members, upon signifying their intention, and upon the payment of the assessment of one dollar. The meeting then adjourned.

The mycologists present were Arthur, Atkinson, Burrill, Clements, Clinton, Duggar, Farlow, Fink, Freeman, Hedgcock, Kellerman, Macbride, Shear, Thaxter, Tracy.

The papers presented Wednesday morning were as follows:

The Genus Harpochytrium; Its Development, Synonomy and Distribution. G. F. Atkinson.

The Phylogeny of Lichens. F. E. Clements.

The Necessity of Reform in the Nomenclature of Fungi. F. S. Earle.

The Taxonomic Value of the Spermogonium. J. C. Arthur.

Proof of the Identity of Phoma and Phyllosticta on the Sugar Beet. G. G. Hedgcock.

Unpublished Notes on the Uredineae. M. A. Carleton.

Craterellus taxophilus, a New Species of Thelephoraceae. C. Thom.

Fungi Cultivated by Texas Ants. A. M. Ferguson.

Symbiosis in Lolium. E. M. Freeman.

In the afternoon of the same day the following mycological papers were, by courteous arrangement, read before the Botanical Society:

Cultures of Uredineae in 1903. J. C. Arthur.

Uredineous Infection Experiments in 1903. W. A. Kellerman.

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NOTES.

IT is a pleasure to record the fact that a Society of Mycologists was organized at St. Louis, during the recent meeting of the A. A. A. S. A full account of the organization has been furnished by the secretary, and is published in this number of the JOURNAL.

THE tender of the office of president of the Society to the eminent mycologist and President-elect of A. A. A. S., Dr. W. G. Farlow, elicited an expression of his hearty approval of the organization, though he was constrained to decline the honor because of pressing duties. Dr. Roland Thaxter was then made the presiding officer by a unanimous vote.

THE formation of a new scientific society when it has already been hinted that too many now are in existence, suggests the statement that perhaps unity of interest and purpose—as in case of this newly formed mycological society — should be the basis of all the organizations.

A READJUSTMENT of the numerous affiliated Societies and Sections of A. A. A. S., perhaps possible, surely desirable—may be, involving cleavage along new lines in some cases—ought to remove present friction and better subserve the interests of all.

IN connection with the matter it may be added, that it is perhaps too much to expect, or even to hope, that all mycological papers—whether detailing research work, or discussing phases of this branch of botany—may be read before this newly formed Mycological Club; in the latter at any rate the purely technical matters, and important topics such as bibliography and publication, nomenclature, group limits, etc., may be discussed to mutual advantage, and concerted action and uniform practice now and then induced.

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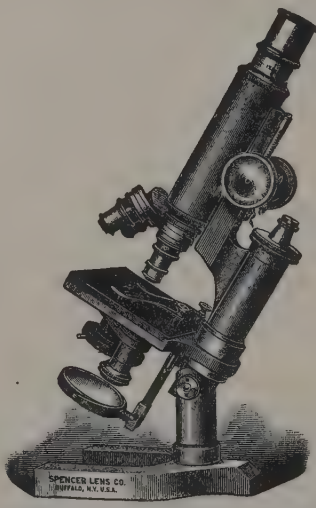

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Ed. Fischer in Botan. Zeitung.

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